# Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

VOL. 71—No. 3. CHICAGO, SATURDAY, JULY 21, 1917. PAGE 89

Main Buildings of St. Stanislaus Seminary, Florissant, Mo.

# Electricity for Suburban and Country Institutions

## *Possible to Furnish Very Complete and Satisfactory Electric Service to Such Institutions as Shown at Jesuit Seminary Near St. Louis—Light, Power, Cooking, Heating and Farm Work*

By EDMUND F. BRIGHAM

THE IDEAL location for an educational or charitable institution is in the country in order to secure the most wholesome environment for the students or inmates. Such a location, however, involves some difficulties due to the absence of city conveniences, such as electricity and water supply and fire protection. Where these are entirely missing there may be serious fire hazard caused by reliance on kerosene, gasoline or acetylene lighting systems.

Electricity may, of course, be generated locally, but this requires quite a plant for a large institution. That it may be furnished most successfully from any nearby electric power transmission system is demonstrated by the recent complete electrification of the buildings and adjoining large farm of a well known educational institution near St. Louis. This article will describe the installation briefly. It will be found that it possesses numerous interesting features.

St. Stanislaus Seminary, situated at Florissant, Mo., about eighteen miles northwest of St. Louis, is an institution belonging to the Society of Jesus, where young members of that order are trained and educated for the priesthood. Four large four-story buildings, three of brick and one of stone, afford living quarters for the hundred and eighty or more members of the community. There are, besides, numerous small work buildings, for the Seminary is a veritable little city, and, with the exception of meats and groceries that are procured from St. Louis, all the needs of the community are supplied on the grounds. The institution has its own bakery, shoe shop, laundry, cannery, cold-storage plant, dairy, pumping station, blacksmith and carpenter shops, winery (the Seminary has a fine large vineyard), garage and stable. There are also a two-story frame building for the workmen, a large stable for horses and mules, an immense brick cow-barn, and the out-buildings essential to the working of a 900-acre farm. From this it is easy to see that the authorities at St. Stanislaus were tackling no easy proposition when in 1915 they determined to install electricity for power and lighting.

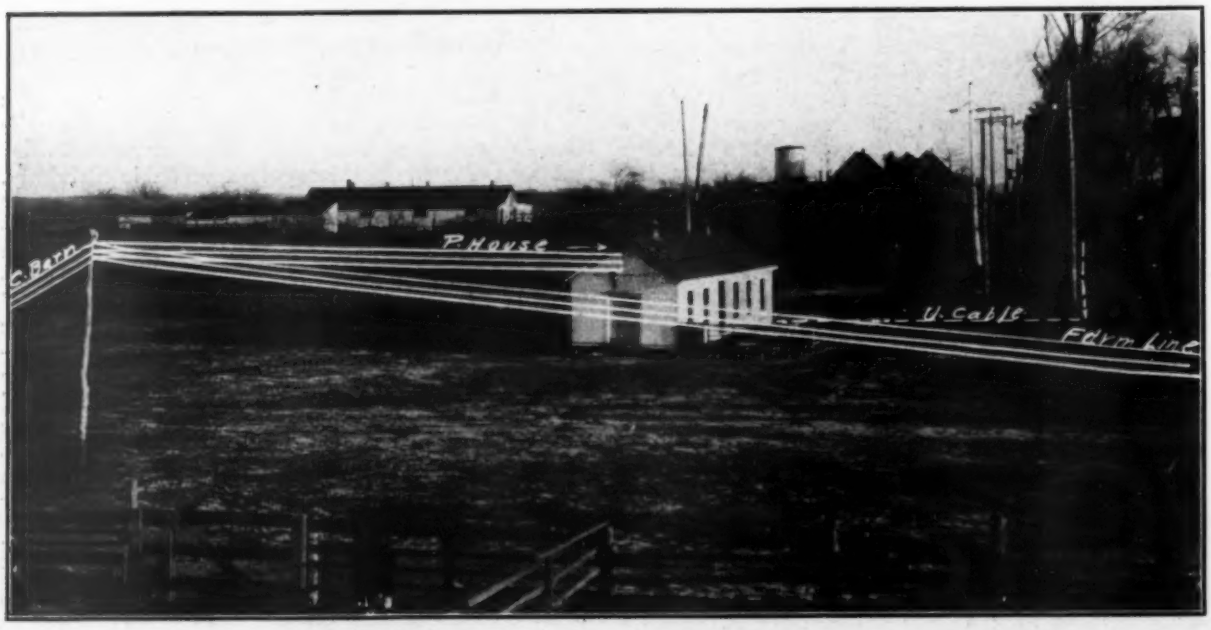
On the Seminary's guaranteeing a connected load of 60 kilowatts, the Electric Company of Missouri agreed to tap its 60-cycle, 4,000-volt, three-phase line along the St. Charles rock road at Pattonville, and to run a three-phase line the intervening six miles to St.

Seminary End of Transmission Line, Showing Transformers and "Round House."

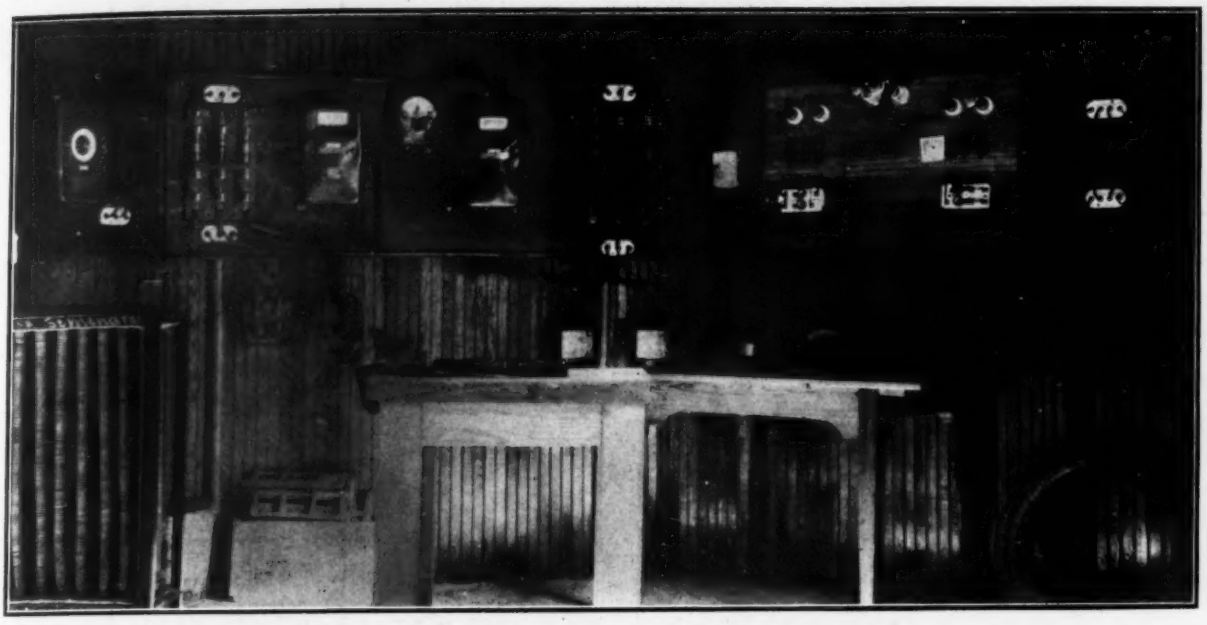
Stanislaus. Accordingly, three 75-kilowatt, delta-connected transformers were set up on four poles at the Pattonville end, to boost the voltage to 13,200. No. 0 galvanized-iron wire was used for the line wires (copper was not feasible on account of the condition of the market) and the Pattonville end was equipped with disconnecting switches and fuses. Standard 40-foot cedar poles with V-braced crossarms were used; on dead-end poles the V-brace was inverted to afford ample clearance for the line wires. For lightning protection, a fourth wire, grounded at every sixth pole, was carried on bayonets above the line wires.

At the Seminary end the line was equipped with three Burke disconnecting switches and three horn gaps and run into three 25-kilowatt transformers, which step down the voltage to 220 volts. These transformers are hung on two poles in triangular fashion, one in front and two in back, thus greatly simplifying the delta connection and giving good clearance for all high-tension wires. From the transformers the power and light lines are carried directly into what is called the "Round House," the Seminary's main distribution point, the 110-volt light circuits being taken from the middle taps of the delta connection on the transformers.

From the Round House to the four main buildings




Portion of the Farm Lines, Showing Location of Underground Cable and Overhead Wires.

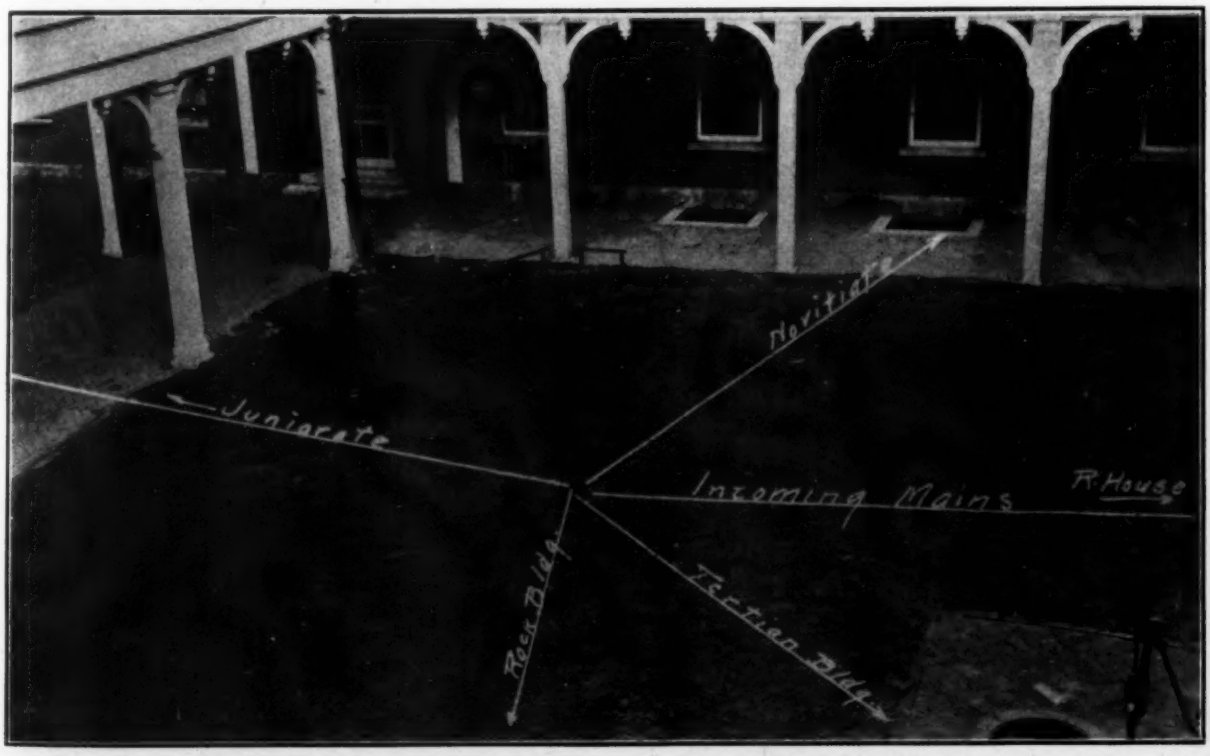


Interior View of "Round House" or Main Distributing Center.

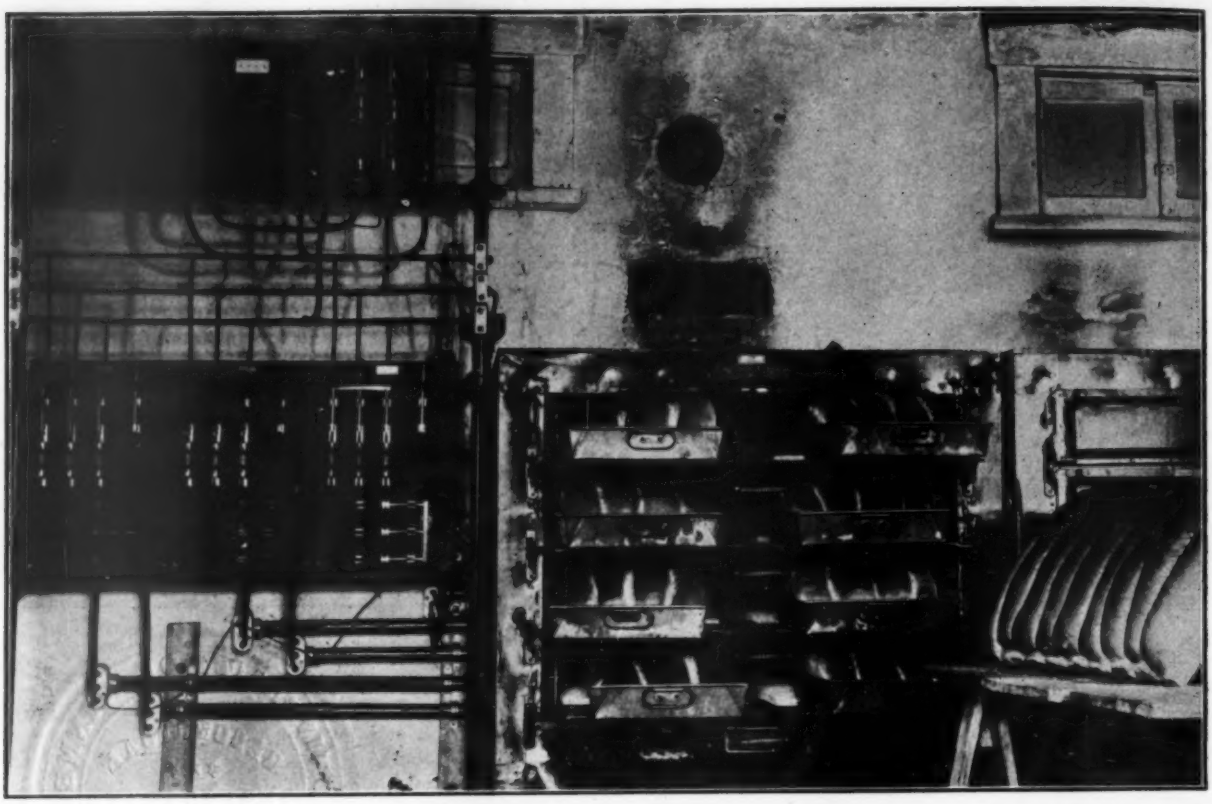
overhead lines were out of the question; they would have disfigured the Seminary's well-kept grounds. Accordingly, two steel-armored cables, for light and power, respectively, were run underground to a central manhole in the quadrangle on which these buildings front. From this point separate underground connections were run to each building, provision being made for another connection with a chapel soon to be erected.

### Interior Wiring of Buildings.

Before taking up the salient features of the interior installation, we must take notice of the fact that every bit of the work at St. Stanislaus was done by the students themselves. They were divided into separate groups for mason, conduit and wiring work, and were under the direction of an electrical engineer, the only one among their number with any previous experience. To get an idea of the difficulties they met with, it may be stated that when the buildings at the Seminary were put up, absolutely no provision was made for future wiring. One of them was an old stone structure, built in 1847, with even interior walls of stone two feet thick, and every bit of woodwork dowelled. In another, the 16-foot ceilings necessitated the erection of special scaffolding to install the conduit.




Location of Central Manhole in Quadrangle and Underground Cable Lines to Four Main Buildings.



Corner of Bakery Showing Switchboard and Meter for Three Bake Ovens. One Oven Just Opened to Show Capacity Yield.

In each of the buildings, the incoming line was run into an entrance box, equipped with fused knife switch for three-phase distribution. In three of the buildings the light circuits are all controlled by two 10-circuit distribution cabinets; in the fourth each floor has its separate distribution cabinet. Conduit was used practically throughout, loom and flexible being used for some few branch connections. With the exception of the principal mains in each building, practically all the work was concealed—no easy feat, if we remember the two-foot walls and the dowelled woodwork.

Worthy of especial note was the wiring of two study halls. They were equipped each with 52 waterproof floor outlets for individual desk lamps. One of them was situated on the ground floor and here the outlets were fed from lines carried in 1½-inch conduit hung on an I-beam in the basement; in the other they were fed from lines carried in conduit along the baseboard and connected under the flooring by means of loom and flexible. Another neat bit of wiring was done in the infirmary, where each room was equipped with floor, wall and ceiling outlets for heating and illumination.

Worthy of note, too, is the fact that for all large areas and outdoor approaches, high-power Mazda type C lamps were employed. These lamps leave nothing to be desired in the way of efficient illumination, and their opal pear-shaped inclosing globes eliminate glare and protect the lamp itself. In all some 600 lamps were put in at St. Stanislaus, to total about 22,000 watts.

### Circuits and Motors for the Farm.

To handle the farm circuits, two separate 220-volt lines were run from the Round House; for the portion of one that supplies the work buildings on the grounds proper, steel-armored cable was laid underground as before. Taken off this line is a 10-horsepower, three-phase General Electric induction motor with compensator, to operate the laundry. A similar three-phase induction motor operates the ammonia compressor for the cold-storage plant and a 5-horsepower, three-phase motor pulls a deep well pump. A De Laval electric separator was likewise installed in the dairy. On this line we also find a 10-horsepower corn grinder and a 10-horsepower circular saw.

According to agreement with the Electric Company of Missouri, which granted 20 per cent of the total connected power load for light consumption, all the lighting circuits in the farm buildings were taken off the power line by means of a balance coil.

### Exceptionally Complete Electrical Equipment in Kitchens.

Some of the latest electrical appliances have been installed at the Seminary. A General Electric type S-3 range was set up in the kitchen of the Infirmary which was likewise provided with two 18-inch exhaust fans, and with outlets for the use of a vacuum cleaner. Heaters are being placed in the rooms and tests are being made for space-heating equipment. The community kitchen was equipped with a large electric potato peeler and a two-horsepower induction motor running a countershaft that drives meat grinders, coffee grinders, etc.

There has also been specified an electric bake oven capable of baking 100 24-ounce loaves of bread per hour, and an electric range capable of cooking meals for 350 persons. This range will have four large ovens and two broilers which will broil 140 pounds of steak in an hour. The range will be used for ordinary cooking operations, but all vegetables, soups, etc., will be prepared in six large electric cookers, three of 25 and three of 30-gallon capacity, specially constructed and

the largest of their kind in the country. These cookers are made so as to prepare large quantities of vegetables economically, by steaming instead of boiling them. All meats will be roasted in a special oven which will be separate from the range.

A plate warmer 10 feet long and 3 feet wide, fitted with compartments and an extension table 5 feet long will also be provided. The plate warmer is built low and will have a top made of ¼-inch steel, which is to be used also as table.

All water-heating for cooking, dish-washing and bathing will be done electrically by two 300-gallon heaters which will furnish approximately 1,000 gallons of water at 180 degrees every 24 hours. From these water-heaters pipes will be run to the coffee and tea urns, which will also be heated electrically. By thus introducing water at 180 degrees into the coffee and tea urns it will quickly be brought to a boil.

The bakery has been equipped with an electric dough mixer with a capacity of one barrel, run by a two-horsepower General Electric induction motor. Three electric ovens have likewise been installed, each with a capacity of 100 24-ounce loaves per hour and built so that it can be connected directly into a 220-volt three-phase line. Thus far no more than two of these ovens have been used at a time, and the output of the two has easily equalled the combined capacity of all three as rated by the manufacturer. In each oven three heats can be employed: high, low or medium. With the brick ovens formerly in use, 24 hours previous heating was needed to obtain the proper temperature for baking; with the electric ovens an hour and a half suffices.

### Comparisons Between Former and Electric Operations.

Between the kerosene lamps previously used and the electrical illumination comparison would be ridiculous. An idea of the saving of expense realized at St. Stanislaus under electrical operation of the various work buildings can be had from the following figures that are typical of operating costs.

DEEP WELL PUMP.

| | Per day. |
|---|---|
| Gasoline-Engine Operation: | |
| Consumption 2 gallons per hour at 13 cents × 10 hours | $2.60 |
| Electrical Operation: | |
| 5-H. P. motor consumes in 10 hours 37.3 K. W. H. × 3 cents | $1.12 |
| Saving | $1.48 |

Note: This does not take into account the fact that an alternating-current motor scarcely ever needs repairs; on a gasoline engine there are habitual repairs, involving more or less expense. This motor paid for itself in the first month of operation.

LAUNDRY.

| | Per day. |
|---|---|
| Steam Operation: | |
| Coal consumption (10-hour day), 1575 pounds | $1.95 |
| Cartage of coal | 0.50 |
| Lubrication | 0.30 |
| | $2.75 |
| Electrical Operation: | |
| 10-H. P. motor consumes in 6 hours 44.6 K. W. H. × 3 cents | $1.34 |
| Miscellaneous | 0.17 |
| | $1.51 |
| Saving | $1.24 |

AMMONIA COMPRESSOR.

| | |
|---|---|
| Steam Operation: | |
| Coal consumption per day | $1.75 |
| Cartage of coal | 0.50 |
| Miscellaneous | 0.15 |
| | $2.40 |
| Electrical Operation: | |
| 6 K. W. for 6 hours × 3 cents | $1.08 |
| Miscellaneous | 0.15 |
| | $1.23 |
| Saving | $1.17 |

Naturally, such results have made electricity very popular at St. Stanislaus Seminary.

Three New Electric Ovens in the Bakery, Middle One With Full Batch of Baked Loaves.

# Voltage Regulators for Alternating-Current Feeders

## *Necessity for Feeder Regulation and Types of Feeder Regulators Discussed—Voltage Relations, Characteristics, Connections and Control of Each Type Described*

By NORMAN G. MEADE

ECONOMIC generation and distribution of electric power requires the use of large generating units, the establishment of generating stations of great capacities, the transmission of power at high voltages to step-down transformer substations, and the distribution of this power to the consumers at relatively low voltages. This system results generally in unsatisfactory voltage regulation, due to the variations in the load of the various feeders, unless means are provided for its adjustment.

### Need for Feeder Regulation and Types of Regulators.

The voltage of a generator or a number of generators in the same station may automatically be maintained constant, regardless of the load at the station bus or at any point on the transmission system, by means of a generator-voltage regulator, acting on the generator-field, but this arrangement cannot be used for the control of individual feeders. One feeder may serve a business district, while another from the same generator may serve a residential district, and since the current consumption required depends upon the load, and since the peak of the load occurs at different times in different feeders, the regulation of the individual feeder is essential if good regulation is to be obtained on the entire system.

In order to meet the different requirements and to satisfy the varying conditions, feeder regulators have been designed which may be classified as induction regulators, and switch-type or step-by-step type regulators, and each of these subdivided into hand-operated and automatically-operated types. Feeder regulators are generally variable-ratio transformers, or compensators, having two separate and distinct windings, primary and secondary, connected respectively across and in series with the feeder to be controlled.

### Principle of Operation.

Fig. 1 shows this type of regulator in its simplest form. When the double-throw switch is in the position shown the secondary voltage is added to that of the primary and the resultant feeder voltage is 2,220 volts. When the switch is thrown to the downward position the regulator transformer is cut out of circuit. The product of the volts and amperes on the generator or busbar side is always equal to the product of the volts and amperes on the feeder side, less the small loss of the regulator itself.

This principle applies to both the single-phase and the polyphase types of regulators, but for simplicity of illustration assume a single-phase regulator for a 100-volt, 100-ampere circuit having a capacity to produce a total range of 20 per cent in the voltage of the circuit, that is, a variation of 10 per cent above to 10 per cent below normal, and further assume that there is no loss in the device itself. The value of currents and voltages may then be shown graphically as in diagrams *A* and *B* in Fig. 2, the former showing the values with the regulator in the maximum boosting position, and the latter with the regulator in the maximum lowering or bucking position. Intermediate values may be similarly shown.

With a regulator capable of a total variation of 20 per cent, in the maximum boosting position 9 per cent of the current flows through the primary and back into the line, and this amount is, therefore, deducted from the useful current in the feeder, but the feeder potential is thereby increased 10 per cent; whereas with the regulator in the maximum lowering position, the current in the shunt winding is reversed, thus increasing the useful feeder current by 11 per cent, but at the expense of lowering the voltage by 10 per cent.

In practice the secondary winding is tapped at several points, the taps being connected to a dial switch as shown in Fig. 3. The reversing switch when in one position arranges the connections for boosting, and when in the opposite position the connections are made for lowering the voltage of the feeder. The switch arm is divided into two parts insulated from each other as shown, and the two parts connected with a small reactance coil for the purpose of preventing a

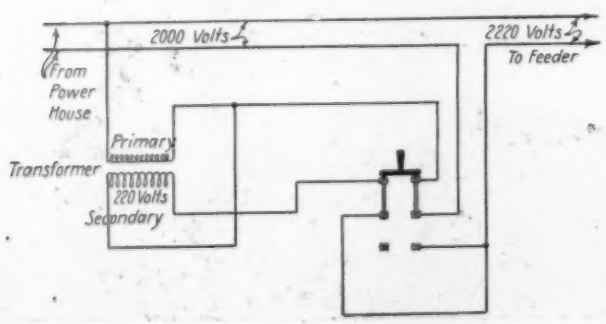



Fig. 1.—Scheme of Simple Feeder Regulator.

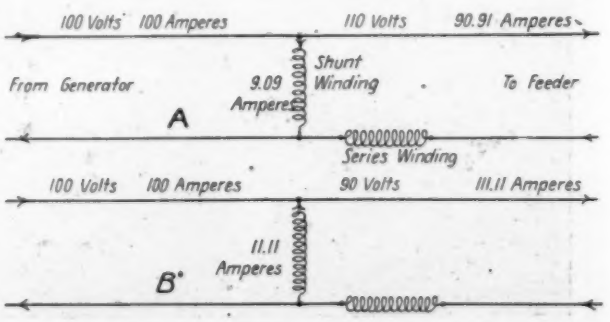



Fig. 2.—Voltage and Current Relations in a Regulator.

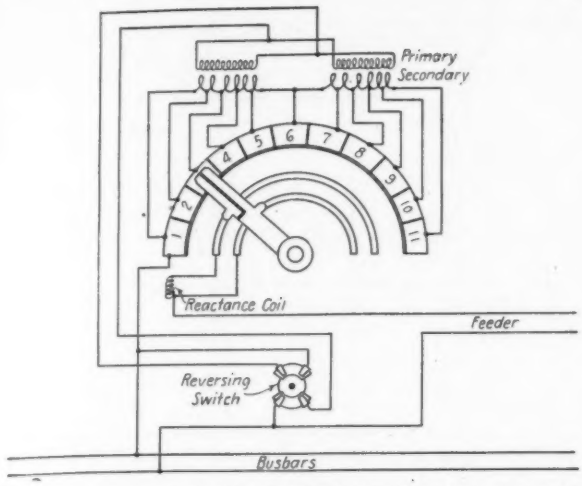



Fig. 3.—A Form of Step-by-Step Regulator with Reversing Switch.

short circuit of the various coils as the switch is moved from one contact to another.

The type of regulator shown in Fig. 4 has an automatic reversing switch *a*. When the switch lever has passed over all of the contact, *d*, *e*, *f*, *g*, etc., and started a second time around, the reversing switch *a* shifts from contact *c* to contact *b*.

## Induction Regulators.

Induction regulators are built in single, three and six-phase types. Although used principally for the control of lighting circuits, they are also well adapted to power circuits, either single-phase or polyphase. In induction regulators two windings are arranged on separate, circular, concentric sheet-iron cores, one of which is stationary, and the other arranged so that it may be partially rotated within the former. The series or secondary winding is arranged in slots on the inside circumference of the stationary core, and the shunt or primary winding in similar slots on the outside circumference of the movable core, and the variation in the feeder voltage produced by the regulator is entirely due to the change in the angular positions of these cores.

Windings on both stationary and movable cores are in effect polar windings. With a given pole of the primary opposite a similar pole of the secondary, the regulator will boost the line voltage, but will lower it if opposite a dissimilar pole; and the change from "boost" to "buck" is gradual as a given primary pole

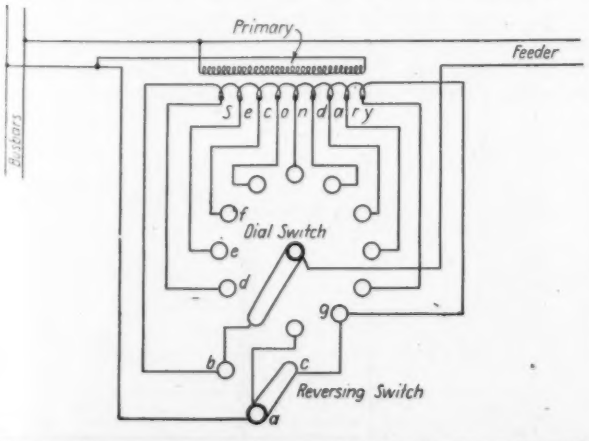



Fig. 4.—Simplified Connections of Regulator With Automatic Reversing Switch.

is rotated through the angle between similar and dissimilar poles of the secondary. The method of producing these results is, however, radically different in single-phase and polyphase types, and each will be described separately.

## Single-Phase Induction Regulator.

The arrangement of the primary and the secondary cores and windings of a single-phase induction regulator is shown diagrammatically in Fig. 5. As there is only one exciting winding, the magnetizing flux is an alternating one and its direction is always parallel to the diameter of the movable coil which passes through the center of the exciting coils, but its direction may be varied with respect to the stationary core, and consequently with respect to the stationary or series winding. With the armature in such a relation that the primary winding induces a flux opposed to that induced by the secondary, the voltage induced by the primary in the secondary is added directly to the line voltage, but is subtracted when the direction of the flux is the same, the complete range being obtained by rotating the armature through an angle of 180 degrees. As the core is rotated gradually, the relative direction of the primary flux, and consequently the

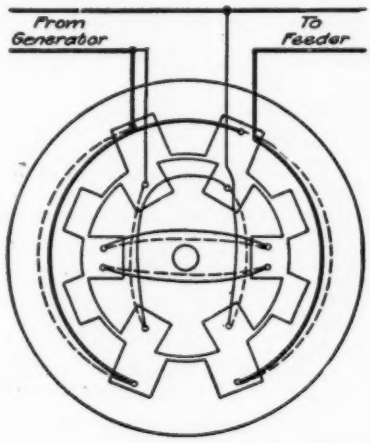



Fig. 5.—Diagrammatic Representation of Single-Phase Induction Regulator.

amount forced through the secondary coils is similarly varied and produces a gradually varying potential in the secondary from the maximum positive, through zero, to the maximum negative value. The induced potential is, however, always in phase with the excitation, and is added directly to or subtracted directly from the line voltage.

The primary or rotating core contains two windings: the active or shunt winding connected across the line, and a second winding short-circuited on itself and arranged at right angles to the shunt winding. The object of this short-circuited winding is to decrease the reactance of the regulator, and its operation is as follows: As the primary and the short-circuited windings are both on the movable core and permanently fixed at right angles to each other, the flux generated by the primary passes on either side of the short-circuited coil, and is, therefore, not affected by it in any way whatever, for as long as no flux passes through this coil there is no current flowing in it. This condition is, however, only true when the armature is in the maximum boost or maximum buck position with current flowing in the series winding, and in any position of the armature with no current in the secondary.

With the armature in the neutral, or no-boost, no-

buck position, the flux generated by the current in the secondary passes equally on either side of the primary coils, which cannot therefore neutralize the flux generated by the secondary. If the primary core were not provided with a short-circuited winding and were rotated from either maximum position so as to reduce the primary flux passing through the secondary, and if the line current remained constant, a gradually increasing potential would be required to force the current through the series windings, and a correspondingly increasing flux would have to be generated. This voltage would become a maximum with the armature in the neutral position, due to the fact that in this position the shunt coils are at right angles to the series coils and therefore entirely out of inductive relation to them. The current in the secondary, therefore, would act as a magnetizing current and a considerable part of the line voltage would have to be used to force the current through these coils. The voltage so absorbed would be at right angles to the line voltage, and the result would be a poor power-factor on the feeder.

Figs. 7 and 8 show the values of the primary and the secondary electromotive forces. Let *OA* be the value and time-phase position of the electromotive force of the primary coil, and let *OD* or *OE* be the maximum value of the electromotive force of the secondary; this electromotive force may be either subtracted from or added to the primary electromotive force, depending upon the mechanical position of the moving member, in order to produce the resultant electromotive force. If now the line *OE* be allowed to represent also the mechanical position in electrical space degrees, of the moving members, when the maximum secondary electromotive force is additive in phase with the primary electromotive force, then *OD*, 180 electrical space degrees from *OE*, is the mechanical position of the moving member when the maximum electromotive force is subtractively in phase with the primary electromotive force, that is, in opposition.

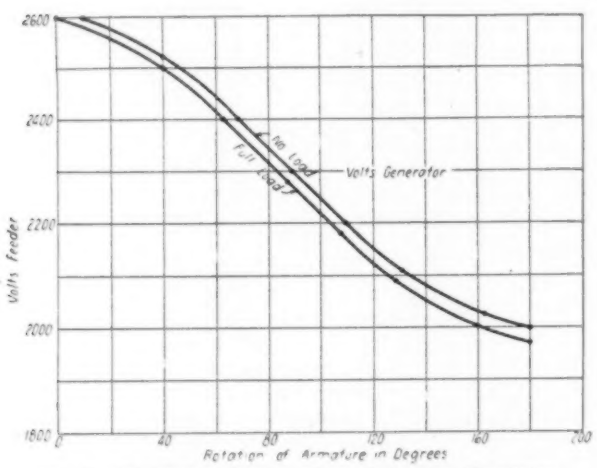



Fig. 6.—Regulation Curves of an Induction Regulator.

When the mechanical position of the moving member is *OB*, Fig. 7, the secondary electromotive force may be considered to have the value *OC* (*CB* being perpendicular to *OC*) but it remains in time phase with *OA*, so that the resultant delivered electromotive force is *CA*. Similarly, when the mechanical position of the moving member is *OB'*, Fig. 8, the secondary electromotive force is *OC'* and is in time phase with *OA*, so that the resultant delivered electromotive force is *C'A*. Fig. 6 shows the regulation curves of feeder voltage of an induction regulator.

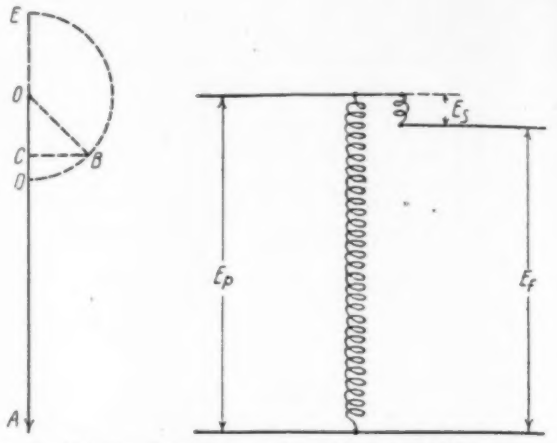



Fig. 7.—Voltage Relations of Induction Regulator, Bucking.

### Polyphase Induction Regulator.

In the polyphase regulator, the excitation is produced by the combined action of shunt windings connected across the separate phases of the system. The shunt windings for the different phases are identical in every way and arranged so that the various windings magnetize a given pole of the regulator in the same direction, that is, each pole is wound with as many distinct and separate windings as there are phases, and these windings are connected to the line in the same order as similar windings on a generator. The magnetizing flux produced has a practically constant value, but does not have a constant direction. The magnetic field is a rotating one, not an alternating one as in the single-phase type and the speed of rotation per pole is the same as that of the generator.

All of the slots on the circumference of a polyphase regulator armature are filled with the windings of the various phases symmetrically arranged as stated and the secondary or series winding is similarly arranged on the inside circumference of the stationary core. The voltage produced in the secondary is due to the rotation of the flux produced by the combined action of the primaries. The voltages generated in the series windings of the various phases are therefore of the same value, and are constant for all positions of the armature, and the variation in the line voltage produced by the regulator is due to a phase displacement, which is illustrated graphically in Fig. 9.

Let *EO* represent the normal potential of one leg of the system and let the radius of the arc *ABD* represent the constant voltage induced in the secondary of the regulator. With the primary coil of leg 1, for instance, directly opposite the secondary coil of the

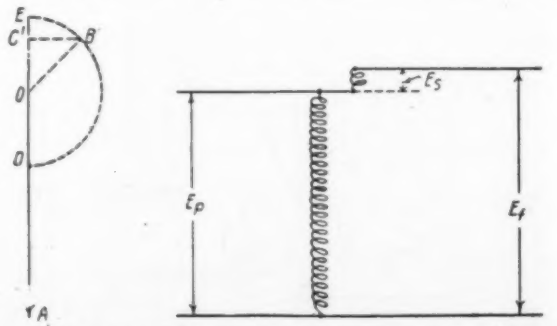



Fig. 8.—Voltage Relations of Induction Regulator, Boosting.

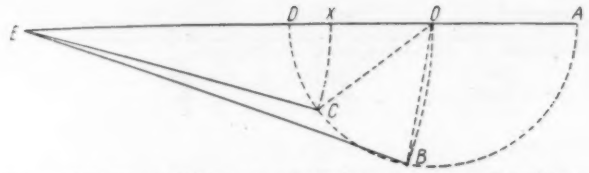



Fig. 9.—Voltage Relations of a Polyphase Induction Regulator.

same leg, the voltage generated will be in phase with the impressed voltage and will be represented by *OD*, and the regulator will lower by the maximum amount, making *ED* the feeder voltage. As the primary is rotated out of this position, the secondary winding considered will be partially excited by the next winding on the armature, so that the voltage generated is not deducted directly from *OE*, but at an angle, as *OC*, and the feeder voltage is the resultant of *EO* and *OC*, or *EC*, which is equal to *EX*. Rotating the armature through an angle of nearly 90 degrees, or to *OB*, so that *EB* equals *EO*, the regulator is in the neutral, or no-boost, no-buck position. Completing the full range of 180 degrees leg 1 on the armature is again opposite leg 1 on the field, but opposite that part of the winding surrounding the dissimilar pole, so that the voltage *OA* is again in phase with *OE*, and the regulator is boosting. The resultant *EA* represents the feeder potential.

Due to the rotation of a similar field produced by the current in the series coils, the currents in the shunt windings are constant regardless of the position of the armature, for a given line current, and the currents in the shunt windings are taken from the line or delivered back into the system as the armature is rotated from maximum boost to maximum buck in the same phase relation as represented by the secondary voltage generated. This condition is due to the fact that the current in the series winding—line current—determines the direction of the current in the shunt winding in the same way that the voltage across

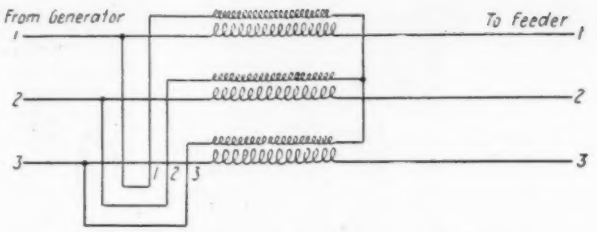



Fig. 10.—Simplified Connections of Y-Connected Polyphase Induction Regulator.

the shunt winding determines the direction of the voltage in the series or secondary winding.

With the arrangement of the shunt windings necessary to the polyphase regulator, the impedance of the device is, therefore, comparatively small without the use of the short-circuited coil required in the single-phase regulator, and the total ampere-turns of the primary are always equal to the total ampere-turns of the secondary, which accounts for the currents in the shunt winding being out of phase with those in the series coils in any other than the maximum boost or buck positions.

Fig. 10 shows simple scheme of connections of a three-phase regulator with Y-connected primaries. Figs. 11 and 12 show the external connections with the auxiliary devices of a single-phase and a three-phase General Electric induction regulator, respectively. Both are automatically operated by three-phase motors and compensated for line drop. Figs. 13 and 14 show, respectively, the assembly of a single-phase and a three-phase induction regulator.

### Operation of Induction Regulators.

Regulators may be operated by hand, either directly or through a sprocket wheel and chain, by a hand-controlled motor, or automatically. If motor-operated with hand control, the motor may be of the alter-

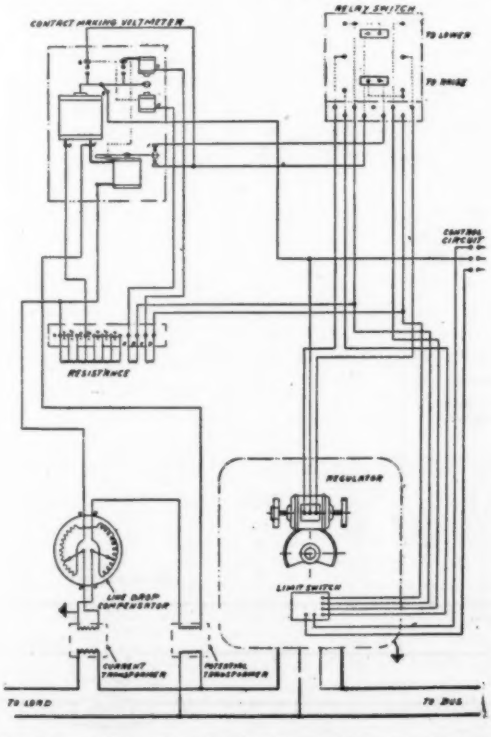



Fig. 11.—Connecting Diagram for Auxiliaries of Single-Phase Induction Regulator.

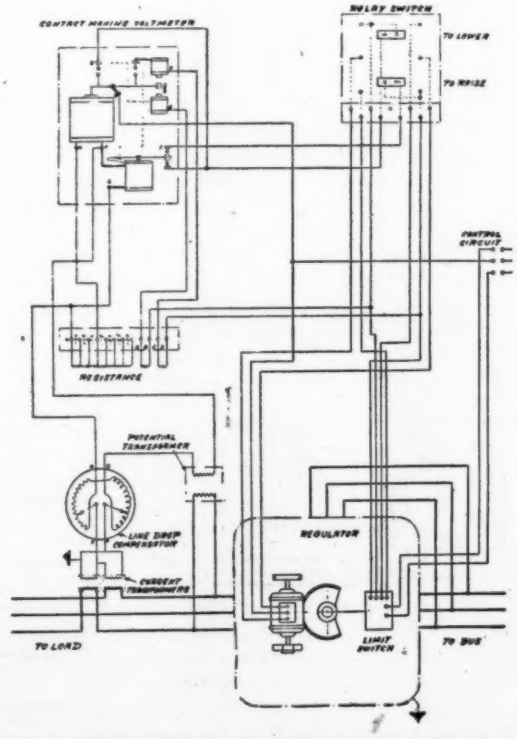



Fig. 12.—Connecting Diagram for Auxiliaries of Polyphase Induction Regulator.

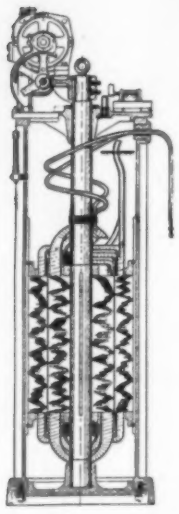


Fig. 13.—Assembly of Single-Phase Induction Regulator.

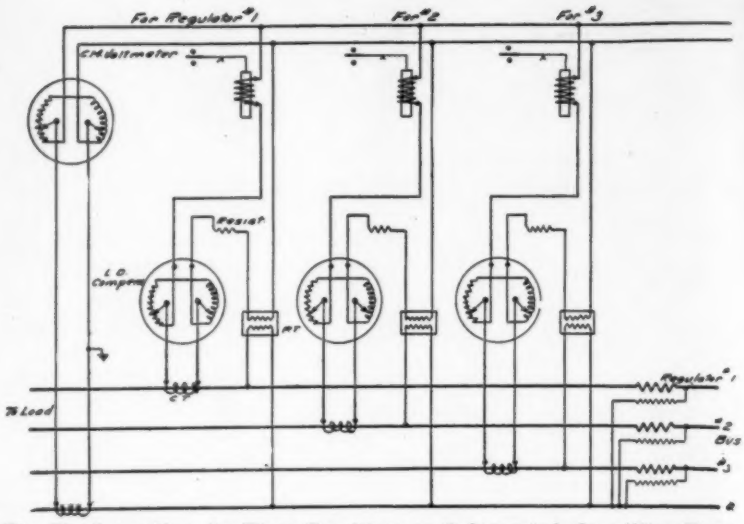



Fig. 16.—Connections for Three Regulators on Y-Connected, Four-Wire, Three-Phase System.

nating or the direct-current type, but preferably of the alternating polyphase type. If automatically operated, the motor should be of the polyphase type, as the single-phase alternating and the direct-current motors are not well adapted for this purpose. A limit switch is provided which stops the movement of the regulator by opening the motor circuit as soon as the regulator has reached either extreme position, but which automatically closes the circuit again as soon as the regulator armature receeds from the extreme position.

Automatic regulators are provided with double-pole, double-throw switches electrically controlled by means of a relay or contact-making voltmeter, the connections of which are shown in Fig. 15. It consists essentially of a solenoid and a laminated iron core which is partially suspended by a spring and partially by the current in the solenoid, and operates a lever provided with contacts. The lever is connected to one side of a low-tension alternating-current circuit and the contacts are connected to the energizing coils of the relay switch. The other terminals of these coils are connected to the other side of the circuit as shown in Fig. 11. With the line at normal potential, the lever is in a horizontal position and neither contact is closed, but with a variation above or below normal the lever closes one or the other contacts, thereby energizing one of the coils of the controlling switch, which starts the motor in one direction or the other until the predetermined line voltage is again obtained.

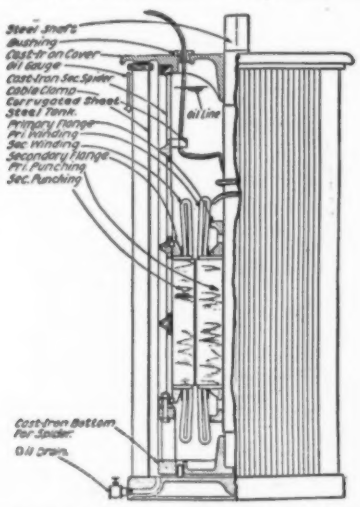



Fig. 14.—Assembly of Three-Phase Induction Regulator.

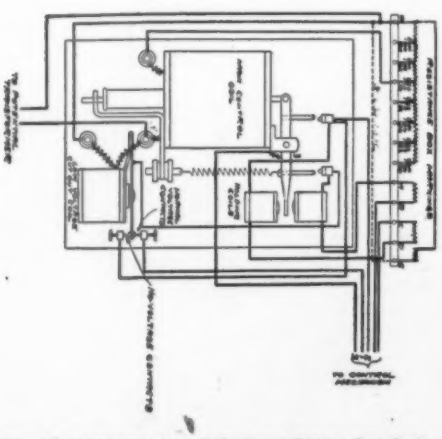


Fig. 15.—Connection of Control Relay for Automatically Controlled Regulator.

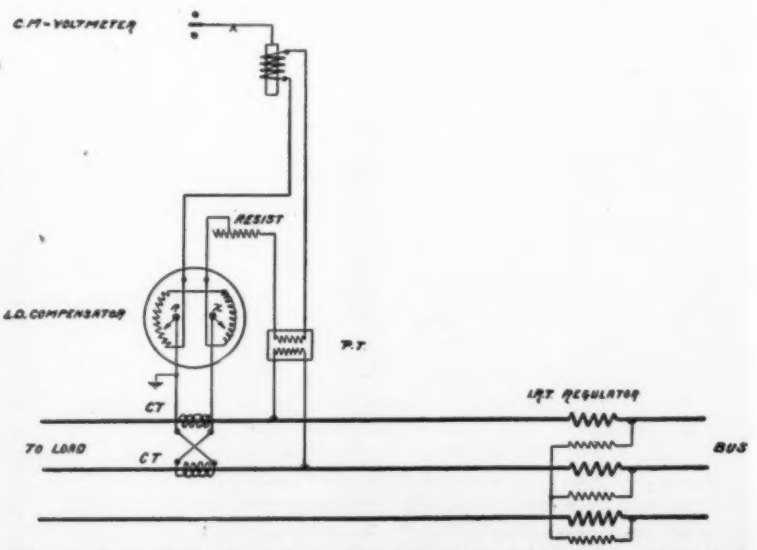



Fig. 17.—Connections for a Three-Phase Induction Regulator on Three-Wire, Three-Phase System.

If it is desired to compensate for line drop, either ohmic or reactive or both, and maintain a constant potential at some distant point, a line-drop compensator is used which is shown diagrammatically in Figs. 11 and 12.

Fig. 16 gives the connections of three automatic, single-phase induction regulators on a three-phase, four-wire system. Fig. 17 shows the connections of a three-phase induction regulator on a three-phase system.

### Lightning Protection for Regulators.

Voltage regulators are exposed in a peculiar manner to line disturbances, and it is therefore necessary that precautions be taken to protect them. Such protection is particularly needed in circuits where frequent and severe disturbances originate, either in the high-tension circuit which supplies the feeders through step-down transformers, or in the feeder circuits themselves. The usual practice of installing aluminum arresters on the feeder bus and multiple-gap arresters and choke coils on each feeder affords, in most cases, sufficient protection. In special cases, as shown in

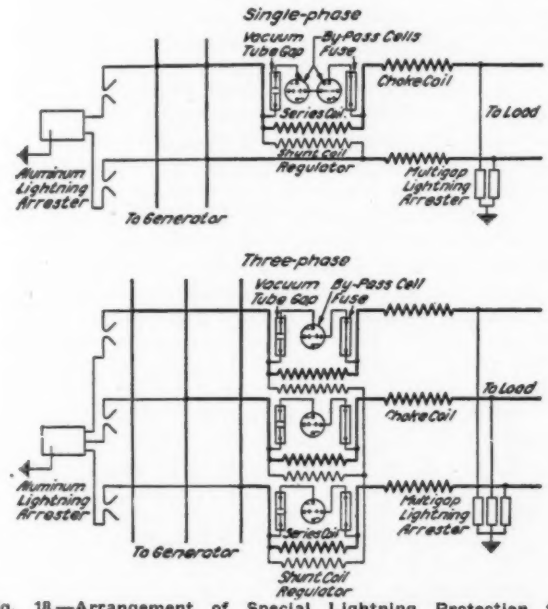



Fig. 18.—Arrangement of Special Lightning Protection for Single-Phase and Three-Phase Feeder Regulators.

the diagrams of single-phase and three-phase feeder regulators in Fig. 18, additional protection should be provided by installing by-pass cells across the series windings of the regulators to allow the disturbances to pass around the regulator to the bus arrester instead of through the windings.

## Work of the Public Service Commission, First District, New York.

The Public Service Commission for the First District, New York, was ten years old July 1. In all save one state of the Union, there are today regulatory commissions, most of them established since the creation of the New York State Commissions and many of them founded upon the same lines, differing however from the New York Commission for the First District in that they have no local rapid-transit powers.

Under the powers last mentioned the Commission for the First District is constructing the great Dual System of rapid transit, involving the expenditure of an amount between $350,000,000 and $400,000,000, about one-half of which is being contributed by New York City. The construction of the new system of rapid transit has been properly described as the greatest single municipal transportation achievement in America and perhaps is to be recorded as the greatest single achievement of the Commission. This system, including the third-tracking of the elevated lines, will add 345 track miles to the existing rapid-transit mileage and will give New York City something more than 600 track miles of such lines, more than is possessed by any other single city in the world, and more, it is said, than all of the other cities of the United States put together.

Under its regulatory powers the Commission for the First District has exercised jurisdiction over stock and bond issues of corporations, has accomplished reductions in rates charged for gas and electricity, has eliminated many dangerous railroad grade crossings, has improved the installation and equipment of the various companies under its control and has effected a great and positive saving of human life by the enforcement of safety precautions and the installation of safety devices. It has handled many thousands of complaints from the patrons of public utilities and has settled a large proportion of those complaints really justified, to the satisfaction of the complainants.

## An "Average Eye" for Heterochromatic Photometry

The comparison of lights of different colors is supposed to be based on an "average normal eye." The Bureau of Standards, Washington, D. C., has just issued a new publication (Scientific Paper No. 299) entitled "An Average Eye for Heterochromatic Photometry, and a Comparison of a Flicker and an Equality-of-Brightness Photometer." This paper records an attempt to approximate the results of such an eye with typical color differences by using a large number of observers. In particular, results obtained by a flicker photometer and by an equality-of-brightness photometer, with different degrees of color differences, are compared. In terms of the Ives-Kingsbury test solutions, for which the proposed normal ratio of transmissions (with four-watt per candlepower carbon lamp) is 1.00, the average of 114 observers gives a ratio of 0.99. By using these test solutions, results obtained on the flicker photometer by a small number of observers can be corrected so as to give normal values with a high degree of accuracy. On the average, equality-of-brightness measurements also vary in proportion to the test ratio, but erratic variations often overshadow these systematic differences. For sources having relatively high intensity in the blue, flicker values tend to fall below those obtained on the usual standard photometers, but the difference is comparable in magnitude with the uncertainty of the latter values.

**Lorain Central Station Makes Steam-Pressure Record.**—In spite of unusual labor conditions, difficulties in obtaining coal and widely varying loads, the Lakeside plant of the Lorain (O.) County Electric Company has been making some enviable records on the recording steam-pressure gauge. The steam pressure, acording to these charts, has not varied more than 10 pounds since April 5, when a 15-pound notch in the chart occurred at 3 a. m. No real trouble was experienced since a month before the date mentioned.

# Automatic Starting for Squirrel-Cage Induction Motors

## *Description of the Construction and Operation of an Ingenious Automatic Compensator Which Is Easily Installed and Controlled—An Important Development for Industrial Plants*

By H. F. STRATTON

*Electric Controller & Manufacturing Company, Cleveland, Ohio.*

IT is not necessary to argue the advantages of the automatic motor starter; practically all people appreciate and desire the benefits of "push-button control" for starting electric motors. Until six or seven years ago hand starters were used with the majority of both alternating-current and direct-curent motors. The automatic starter for direct-current motors made its appearance about that time, and its numerous advantages were immediately recognized by the users of motors. The growth of the direct-current automatic starter has been startling.

Unfortunately, the same advance has not been made in the development of the automatic starter for alternating-current motors, although there are more squirrel-cage motors in use than any other type of electric motor from the standpoint of numbers and total horsepower. The need of an alternating-current automatic motor starter has been clearly shown by the constant demand for something which would do for the squirrel-cage motor what the automatic starter has done for the direct-current motor. This article describes an automatic starter or compensator for squirrel-cage motors.

This automatic compensator can be installed by an electrician of ordinary ability, it can be operated by anyone who knows enough to push a button for starting and another one for stopping, and under ordinary conditions it will run years without attention.

It is common practice to allow 50 per cent overload for the starting current of a direct-current motor; in fact, it is rather necessary not to exceed 50 per cent overload, principally because greater currents are apt to injure the commutator. As the squirrel-cage motor has no commutator, or in fact, any sliding contacts, it is not necessary to limit the starting current on this account. It probably would not injure the majority of squirrel-cage motors to throw them directly across the line provided the motor started promptly. It would, however, cause such line disturbances due to the excessive current, that it is customary to apply less than line voltage for starting squirrel-cage motors larger than 5 or 7½ horsepower. A transformer having several selective voltages, less than line voltage, is generally used for starting, and after the motor has attained a fair speed, the transformer is disconnected from the motor and line voltage is applied.

The objectionable high starting current which is secured by applying line voltage to the motor can be reduced by applying a starting voltage less than line voltage. The objection to reducing the starting voltage is that the starting torque is also reduced, and in fact it is reduced more rapidly than the starting current. The starting torque varies as the square of the starting voltage, so that if half line voltage is applied to a motor at standstill, the motor current would be reduced to one-half, but the torque would be reduced to one-quarter. As neither a high starting current nor a low starting torque is desirable, a compromise is reached between the two and a starting voltage is applied to the motor which furnishes sufficient torque to start the load and accelerate it with reasonable promptness. Three or four different taps are generally brought out from the transformers, so that the particular voltage can be applied at starting which is best for each application, bearing in mind the desirability of reasonably quick starting and the reduction of the starting current to as small a value as possible.

Fig. 1 shows the connections usually employed in starting a three-phase squirrel-cage motor. $L_1$, $L_2$ and $L_3$ are the line wires; $T_1$, $T_2$ and $T_3$ are the three coils of a three-phase transformer, each coil having several taps for changing the starting voltage. All the switching contacts marked $S$ are closed in starting, and all marked $R$ are closed in running. With the starting contacts closed, a reduced voltage is applied to the motor, and when it has attained a certain speed, the starting contacts are opened and the running contacts are quickly closed, disconnecting the transformer from the line and connecting the motor directly to the line.

Substantially the same results can be obtained by means of the connections shown in Fig. 2, in which $L_1$, $L_2$ and $L_3$ are the line wires; $T_1$ and $T_3$ are two coils of an open-delta transformer, each coil having several voltage taps. With this method of connection only four starting contacts and two running contacts are required, as against six starting contacts and three running contacts, as shown in Fig. 2.

It is true that the connections of Fig. 1 disconnect the three lines to the motor when the starter is in the "off" position, and the connections of Fig. 2 allow the line $L_2$ to remain connected to the motor with the starter in the "off" position. The advantage of disconnecting the three lines from the motor is, however, more apparent than real. Bearing in mind that it is necessary to install a three-pole disconnecting switch back of the starter, it is obvious that this service switch would disconnect the motor also, thereby making the

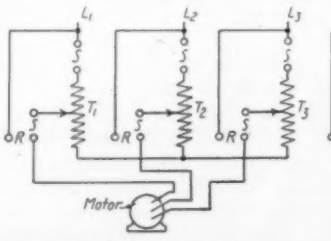



Fig. 1.—Scheme of Connections for Ordinary Three-Phase Compensator.

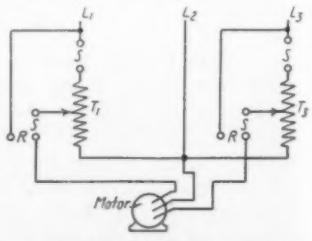



Fig. 2.—Connections for Three-Phase Compensator of Open-Delta Type.

Fig. 3.—E. C. & M. Automatic Compensator.

complete installation, including motor, starter, and connecting leads, entirely safe for inspection or repairs. To depend upon the starter to disconnect the motor and to depend upon the service switch to disconnect the starter involves such confusion that it is simpler and safer to depend always upon the three-pole service switch for the disconnection of both motor and starter. As to the advantages of the open-delta connection for starting, it requires six switching contacts instead of nine, resulting in economy of space, weight, complication and expense, and therefore is used in the E. C. & M. compensator.

### Description of the Automatic Compensator.

Speaking generally, this automatic compensator starts a squirrel-cage motor in the usual way, in that the motor initially receives a reduced voltage through a transformer, and after the attainment of considerable speed, the reduced voltage is withdrawn and line voltage is quickly applied to the motor. Beyond this similarity, the E. C. & M. automatic compensator differs radically from any existing equipment.

Externally it presents the appearance of a symmetrically shaped iron case, fitted at the top with a weatherproof iron cover, as shown in Fig. 3. Eye bolts hold the cover in place and also furnish means for attaching a crane or other hoisting machine to the compensator in order that it may be conveniently handled. At the front and bottom a hole is tapped into the case, and normally a plug is screwed into this hole. If it is desired to drain the oil from the case, the plug is unscrewed. Holes are cast in the flange at the bottom, two on each side of the case, for bolting the machine to the floor or bracket. The necessary leads emerge at the back, pointing downward and are sealed hermetically tight where they pass through the case. In compliance with safety requirements, the case has convenient means for connecting it to ground. However, with the cover in place, all exposed parts are dead electrically. The compensator therefore can be placed in the most crowded factory with absolute safety, or exposed to severest weather without interference with operation.

The under side of the cover is cast with drip ridges, so that any splashing inside will return the oil to the case and not allow it to reach the exterior. In the boss, somewhat off center, there is a hole which mates with a stud, projecting vertically near the middle of the top of the compensator. The machine itself is built in one unit, which slips snugly into the case from the top, and which is almost completely submerged in oil.

Fig. 4 is a side elevation of the compensator mechanism in the "off" position, and Fig. 5 is an elevation of the relay end. Fig. 6 is a three-quarter side elevation giving a better view of the details of the mechanism, this view showing the compensator in the "starting" position.

In each of these views *T1* and *T2* are the two coils of an open-delta transformer. The voltage taps from this transformer are brought up to a terminal board which is above the oil level, the details being shown fairly well in Fig. 5. Any one transformer is built up entirely of laminations of the same shape and size, so designed that they can be assembled with all joints lapped. The assembled transformer laminations are clamped between the transformer end frames, marked *EF1* and *EF2* in Figs. 4, 5 and 6, and six clamping bolts hold and support the transformer securely in its place.

In Fig. 4, *M* is a U-shaped magnet built up of high-silicon steel laminations which are electrically welded together along six different places on the exterior of the magnetic circuit. Steel plates are also electrically welded to this frame, and are tapped so that, by means of bolts, the magnet may be attached to the main frame of the compensator. There are not any bolts used to hold the laminations together, and there is therefore no danger of these laminations becoming loose and noisy after continued use, as the structure is in reality made into one piece by the extensive welding. After the U-shaped magnet has been welded together, its two pole faces are accurately finished, as also are the supporting plates on the back. Three small and one larger horizontal slot are cut into the upper pole face. These are shown plainly in Fig. 5. The three small slots are oil canals to permit the armature to open rapidly when the magnet is de-energized. In the large slot is held a copper bar, each end of which is riveted to a brass casting extending upward and supported by a slanting piece of molded asbestos board marked *AB* in Fig. 6. This asbestos board also supports on its under side a cast grid resistance unit. The induced current flows through the copper bar, the two brass castings and the resistance unit when the magnet is in operation, and as this electrical circuit encloses only a portion of the upper pole, there are set up magnetic forces in different sections of the upper pole of the magnet which are out of phase with each other, and which prevent the magnet from chattering.

The operating coil *C* encloses the lower pole of the magnet, and the wire is wound on a brass spool with supporting lugs, the spool being completely cut in two and insulated at the joint, so that it will not have any transformer action.

At the face of the lower pole a strip of non-magnetic metal is loosely supported, forming a gap in the magnetic circuit when the armature is closed. This material is not only non-magnetic, but it also has high ohmic resistance, to reduce the heating and the useless wattage which would be caused by eddy currents.

The armature *A* is also built up of electrically welded steel laminations, and is welded to the cast-steel armature lever *AL*, which is pivoted to the frame by means of the phosphor-bronze rod *AP*.

There is only one operating magnet for the entire mechanism, and this one magnet, when energized, must

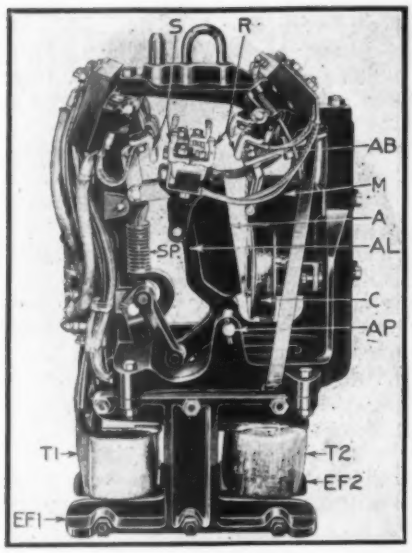



Fig. 4.—Compensator Mechanism in "Off" Position.

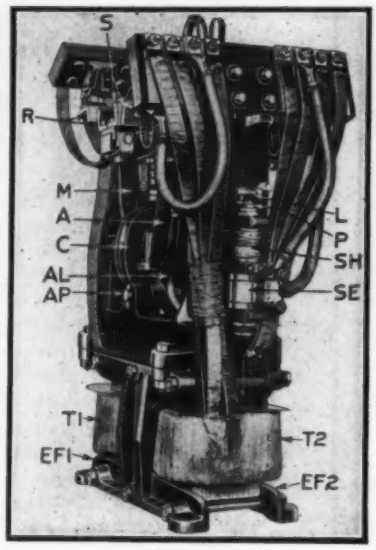



Fig. 5.—Relay End of the Mechanism.

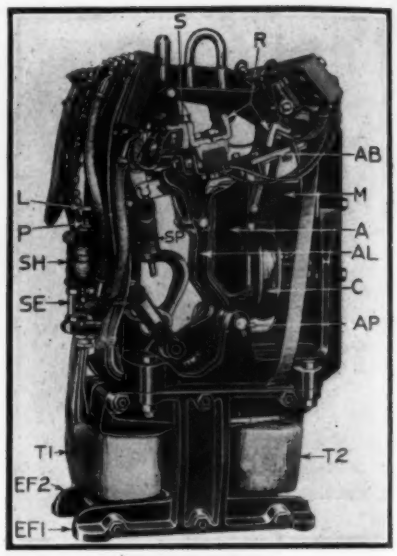



Fig. 6.—Mechanism Shown in Starting Position.

establish the starting connections and, after a delay, allow the starting connections to be broken and the running connections to be established. This is accomplished by a very interesting mechanical movement. With the armature in its closed position, as shown in Fig. 6, it will be noticed that the contacts *S* are in engagement, establishing the starting connections to the motor, and that the spring *SP* has been compressed. Compensator remains in this starting position until it is released by the action of the transition relay. The action of this relay will be explained in more detail later, but for the present it will be sufficient to say that its plunger *P* lifts when the starting current in the motor drops to a value which is suitable for a change in motor connections from the transformer to the line. When the transition relay operates, it raises the pivoted latch lever *L* as shown in both Figs. 5 and 6. This movement of the latch lever permits the compression spring *SP* to act on a toggle joint, quickly throwing the movable contacts from the starting side to the running side; in other words, the motor is disconnected from the transformer and is connected to the line, the relative positions of the parts being clearly shown in Fig. 7. When it is desired to stop the motor, with the compensator in either the starting or running position, the operating magnet is de-energized and all parts fall into the "off" position, shown in Fig. 4.

### Method of Operating.

The following is a brief summary of the sequence of operations: First, the operating magnet is excited, closing the armature, compressing a spring and connecting the motor to the source of supply through the transformer; second, after the motor has attained a suitable speed, the transition relay operates a latch, permitting the compression spring to disconnect the motor from the transformer and the transformer from the line and to connect the motor to the line; third, when the operating magnet is de-energized, the armature falls open and the motor is disconnected from the supply lines. The movable contacts do not pass back and forth across the same line, but follow the path shown in Fig. 8. In other words, any point on the movable contacts completely bounds an enclosed area each time the compensator goes through one cycle of operations, passing progressively from "off," to "start," to "run," and finally again to "off."

The transition relay shown in Fig. 5 includes a top shunt coil *SH* tending to lift the plunger *P* when energized, and a bottom coil *SE* in series with the motor in starting, tending to hold the plunger down when energized. Of course, when the shunt coil overpowers the series coil, the plunger is lifted, resulting in the disconnection of the motor from the transformer and the connection of the motor to the supply lines.

If the shunt coil were always excited by the same voltage, it is obvious that the transition would always occur when the motor-starting current had reduced each time to the same value. This would be a satisfactory operation, if the starting voltage and therefore the starting current were the same under all conditions, but, as a matter of fact, any one set of the three or four sets of voltage taps may be used depending upon the load conditions at the start. The lower the voltage of the selected taps the lower should be the value of motor current at which transition is made. For example, if a certain size motor were being started with the 70 per cent voltage taps, then the transition might occur at 100 amperes, but if the 40 per cent voltage tap were being utilized, then the transition should occur at perhaps 60 amperes.

It would not be convenient to change the adjustment of the transition relay each time different voltage taps were selected, because that would necessitate putting ammeters in the circuit, watching the readings very carefully, and then varying the adjustment of a relay which is completely submerged in oil. It is very easy to make the selection of different voltage taps, because they are all brought up above the oil level to a terminal board, and flexible connectors are provided which can be moved easily to the terminals giving the desired voltage. Obviously, it would be very desirable if the act of selecting the correct voltage taps might also make the proper change in the adjustment of the relay, so that its operation would be right for the particular taps selected. This is what has been accomplished, and the transition relay of the E. C. & M. automatic compensator is self-adjusting, in that the selection of the voltage taps also selects the right adjustment for the operation of the transition relay. In other words, the higher the voltage tap selected, the higher will be the value of motor-starting current at which the relay functions.

This peculiar and beneficial action is obtained by

connecting the shunt coil of the relay, not to a source of fixed voltage, but to a source of voltage which is progressively higher as the higher-voltage starting taps are selected. In other words, a higher voltage will be applied to the shunt coil of the transition relay using the 85-per cent voltage taps than with the 40-per cent voltage taps. With a relatively high voltage applied to the shunt coil of the transition relay, it is able to overpower the series coil at a relatively high value of motor current. Therefore, we reach the condition of increasing the value of motor current at which transition occurs when the relatively high voltage taps are selected for starting the motor.

Both the shunt coil and the series coil of the transition relay can be connected to certain of the main contacts of the compensator whereby they are both excited as long as the compensator remains in the starting position, but are not excited when the compensator is in either the running position or the off position. Consequently, each of these coils is in circuit only a brief time and their connection and disconnection is accomplished without using any small control circuit contacts. The E. C. & M. automatic compensator therefore includes no control circuit contacts and only one coil which is in circuit during running.

The compensator is submerged in oil, with the exception of the terminal board. The oil accomplishes several purposes: it cools and insulates all parts carrying current; it provides constant and liberal lubrication for the moving parts; and it quickly quenches the arc which is formed when the contacts are separated. A special oil is used, which has a high flash point, but which is still liquid enough at zero degrees Fahrenheit to allow free operation. On account of the large volume of oil and the freedom with which copper particles and carbon can settle harmlessly at the bottom, it is not necessary to change the oil before at least five years of average service.

The drawn-copper contacts are of the butt type used in mill switches, special provision being made to reduce as far as possible any disintegration due to their operation in oil. The contact is clamped on the seat by a contact bolt with a slotted head. A tongue in the contact seat matches with a groove in the contact, and the bolt passes through an open slot in the contact. When it is desired to remove the contact it is merely necessary to unscrew the bolt several turns, lift the contact sufficiently to clear the tongue, and then slide it forward, the open slot allowing the contact to free itself from the bolt. As it is not necessary to remove the bolt in replacing contacts, there is no danger of dropping it in the oil.

Fig. 9 shows an easy method of lifting the compensator partly out of the case to inspect or renew the contacts. The eye-bolts are first taken out and the cover removed; the nuts are then screwed up to the shoulders of the eye-bolts, and the eye-bolts are again put in place in the lugs on the case; a crowbar, or any convenient piece of bar iron, is slipped through these eye-bolts and through the U-bolt at the top of the compensator frame; the nuts are next screwed down on the eye-bolts, after the manner of a jack, gradually elevating the eye-bolts and with them the compensator, until they reach the position shown in Fig. 9. It is necessary, of course, to disconnect the leads as shown, before lifting the compensator, but this is easily accomplished in the same way that the contacts are taken off. In other words, merely loosen the clamping nuts and slide the connectors off sideways, the clamping bolts passing through open slots. The same design is followed on the terminal board for the transformer voltage taps, so that the two flexible connectors which are used to select different taps, can be removed by loosening the clamping nuts, and can be fastened to other taps by screwing down the clamping nuts a few turns. In all of these operations the design is such that there are no loose pieces to fall into the oil.

Realizing that many squirrel-cage motors are used in plants having no regular electrical department, this automatic compensator has been designed so that it may be installed without expert electrical superintendence. The first step is to make the necessary connections between the motor, the compensator, and the line. Next remove the cover and pour oil into the case until its level reaches the cast letters, "Oil Level." An attempt should then be made to start the motor under normal load conditions, and if it fails to start, or starts too slowly, the two flexible leads should be shifted to the next higher voltage taps. When the proper taps have been selected, replace the cover and clamp in place. With the completion of the above simple and easily understood operations, the compensator does its own thinking and is ready for a long term of service without any further attention.

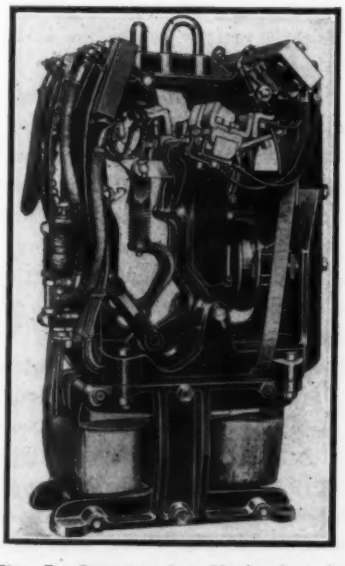


Fig. 7.—Compensator Mechanism in Running Position.

Fig. 8.—Path Followed by the Movable Contacts.

Fig. 9.—Mechanism Partly Raised for Inspection or Change of Contacts.

# Editorial Comment

## *Electricity and the Shipping Industry*

THE important part played by electrical energy and electrical equipment in shipbuilding, as well as in the operation of vessels, becomes more apparent with each passing week. In a recent magazine article it is pointed out that, from reports at hand, about six million tons of merchant ships appear to have been destroyed from the beginning of the war to the first of May last; and this was considerably above new construction for the period. But the submarine scare of last spring has already had a notable effect in increasing construction, while, for more than a year before that, scarcity of bottoms and abnormal freight rates had been stimulating shipbuilders.

On May 1 construction of steel merchant ships in hand in our shipyards reached two million tons—about ten times the amount of steam tonnage turned out in 1914—and since then General Goethals has declared that we shall build 925 vessels, aggregating over three million tons, in the next eighteen months. The submarine scare advertised in most effective fashion the need of merchant ships. A response is coming from every shipyard. Meantime the latest reports indicate that the destruction of merchant ships is rather more likely to decrease than to increase.

It is interesting and significant to note that exports carried in American vessels this year represent about 15 per cent of the total ocean-borne shipments of merchandise from the United States to foreign countries. The percentage increase of figures for goods carried in American bottoms over the preceding April was 31, while the gain by foreign ships as a group was slightly greater, 34 per cent.

The figures for the first 10 months of the current fiscal year show that for this period the increase in shipments in American vessels was much greater than that recorded by foreign ships. Goods carried in ships flying the Stars and Stripes were valued at $621,763,089, a gain from $379,387,555 for the corresponding period of 1915-16, representing 63 per cent advance. Goods transported in foreign bottoms increased correspondingly from $2,582,098,073 to $3,868,335,984, or about 50 per cent. British ships maintained their lead over all other nations. While the part played by Norwegian ships in carrying American exports has become much more extensive during the war, there has been a decline in the value of shipments in Norwegian vessels. This reflects the influence of the large submarine losses affecting the Norwegian mercantile marine, which have resulted in the curtailment of the shipping boom in Norway.

The latest statement of the Department of Commerce, showing net tonnage cleared from United States ports indicates that American vessels are rapidly coming to the front in supplying Europe. The foreign tonnage cleared in trade between the United States and Europe declined as a whole nearly 700,000 tons in the ten months above mentioned, compared with the same period of the preceding year, but for the same period, American tonnage increased 300,000 tons. The figures of clearances bring out the fact, however, that the trade with North American countries is the only one in which the amount of American shipping employed exceeds the foreign tonnage, though there has been a great gain by American shipping in the trade with South America. American tonnage cleared for Asia, Oceania and Africa also recorded a gain over the ten months.

The net loss of shipping has been smaller than many people imagine. The San Francisco Chamber of Commerce recently calculated that, if the present rate of construction and destruction continues unchanged until June 30, 1918, the world's merchant marine would then be slightly larger than it was at the beginning of the war. With the increased construction now provided for, a tremendous gain in tonnage over 1914 now seems probable.

The part to be taken in this vast program by central electric station service at Atlantic, Pacific and Gulf ports, as well as along the Great Lakes, was described by the ELECTRICAL REVIEW in its July 7 issue. It is to be hoped that the electrical industry as a whole will rise to the occasion and show itself worthy in every way of the great opportunity which has come to it to be of maximum service to the country.

## *Public Agrees to Try Higher Fares*

IN A RECENT decision of the Massachusetts Public Service Commission, it was announced that a large and representative portion of the public in the territory of the Bay State Street Railway had agreed with the company upon a six months' trial of a six-cent fare unit on the entire system, which now comprises nearly 1,000 miles of equivalent single track. After hearing the evidence of the company in the case the Commission decided that the institution of this unit would not lead to excessive revenue, and in view of the small amount of significant opposition encountered, the case was thus disposed of for the time being with very little delay. Obviously, the important feature of this proceeding is not so much the formal approval of the Commission as the recognition on the part of a large number of people in the company's territory that something would have to be done to im-

prove the finances of the road in face of rising costs of labor and material. The only alternative, in the long run, seems to be public ownership.

It is a gratifying sign of intelligence that the Bay State company's public, or at least a large and representative portion of it, has no stomach at this time for public ownership or operation and that it prefers to see the company given an opportunity to show what it can do with increased fares. To the railway man it is no doubt burdensome that the company will be obliged to sell twenty tickets for one dollar within its urban territory, but these will not be good for travel at holiday times. The street-railway world is hard pressed at this time by the abnormal cost of everything entering into the service rendered, by jitney competition in many cities, and by labor shortage induced by the war.

All public utility men, therefore, will be glad to note a disposition on the part of a public which only last year opposed a fare increase tooth and nail, to accord the great traction system of the Bay State company at least a measure of relief. The advantage of avoiding another protracted controversy before the Commission is difficult to express in dollars, but it is very great. Surely the American people still may be counted upon to accept increased public utility rates where their need is readily demonstrable, and there certainly never was a time in the history of public utility service when labor and materials were on a plane of cost better suited to show the most hard-headed legislator, commissioner or "Pro Bono Publico" that the true and now enhanced cost of the service he regulates or uses must be met by equitable and now higher charges.

## *Prepayment Meters for Summer Cottages*

IN VIEW of the shifting population of many summer resorts and the consequent burdens of bill collecting, it would appear that a field exists for the use of the prepayment meter in establishments whose occupancy varies materially during the season. The cost of collecting the modest revenue many of these places yield the central station may easily exceed the income in dealing with customers of very humble means located, as not a few are apt to be, remote from the main highways and byways of summer travel. At the end of the season the prepayment meters can be removed for inspection, cleaning, and use at other points on the system. When the cost of sending a collector to scattered residences or camps in a runabout or team is figured, we fancy the decision to provide the meter of the prepay type will not be very long delayed.

The other course is to resort to the flat rate, and many a company dealing with remote and scattered small consumers might do worse than to establish such a system of charging, either with or without an automatic device for limiting the demand. Since much of the summer-cottage business offered in these days does not require any additional investment in generating or distributing equipment (coming off the extreme peak of the year, though still on the summer-evening maximum), the need of a device for limiting the demand is less apparent than on a city apartment-house circuit kept "hot" from September to June by the nightly "pull" upon its useful but invisible commodity.

## *Conduct War Without Politics*

EFFICIENCY is one of the paramount needs for success in conducting the war. Efficiency is about the last thing thought of in public offices that have fallen into the hands of ordinary politicians as we know them in this country. Therefore, politics must be divorced from every branch of governmental activity having to do with conduct of the war. The sad results from failure to observe this rule in previous national emergencies are matters of historical record.

The Export and Import Board, recently created by the Government to exercise jurisdiction over shipping, is one of the most important of the war emergency bodies. It is vital to all shipping interests that this board be kept free from partisan politics in administering affairs pertaining to this branch of service. This the President has apparently kept strongly in mind in making his initial appointments, and it is to be hoped that his course will have vigorous, consistent support in future from members of Congress and the public generally, regardless of political affiliations. The same rule should be adhered to vigorously for all appointments necessitated by the war.

## *Lord Northcliffe and Mr. Vail*

ON ANOTHER page of this issue is printed a photograph of two of the foremost men of our times whom this war has brought together in co-operative effort—Lord Northcliffe and Theodore N. Vail. It would be difficult to find the equal of these two men in their power of achievement and their genius for organization.

Lord Northcliffe is engaged in co-ordinating the manifold and diverse war activities of his government here in America, and Mr. Vail, in addition to his numerous corporate and other responsibilities, is acting as the head of the Advisory Committee on Communications for the Council of National Defense.

The most powerful form of international co-operation is typified in the picture which we present. Such men as these, joining together in the common cause, give assurance that the Allied forces will not be lacking in the most advanced means for electrical communication. The spirit of co-operation which is here represented is but typical of that to be found in all branches of the electrical industry.

# HAPPENINGS IN THE INDUSTRY

***Head of Bureau of Mines Urges Efficiency in Use of Coal—Memorial Library for Prof. S. P. Thompson—Lord Northcliffe Talks Across the American Continent***

## STRONG PLEA FOR EFFICIENT USE OF COAL.

**Director of Bureau of Mines Points Out High Efficiency of Modern Large Power Plants and Urges Elimination of Waste in Small Plants.**

Fully half a billion dollars was wasted last year in this country through the inefficient use of coal, according to Van. H. Manning, director of the United States Bureau of Mines. He further declared that this waste was continuing at an even greater rate and at a much larger penalty to the country because of the increase in the price of coal.

The penalty is not only a heavy tax on the American pocketbook, said Mr. Manning, but it is also an unpatriotic thing, for every pound of coal we waste there is that much less available to put into energy to end the war. Last year the United States mined 600,000,000 tons of coal, the greatest production ever witnessed in the world, and of this amount we wasted 150,000,000 tons, or 25 per cent, through inefficient use.

As an example, in the modern power plants of the country 20 per cent of the heat in the coal consumed is converted into power, whereas in the small power stations the efficiency frequently drops below 10 per cent. Although the average efficiency of all kinds of steam-power plants in the United States can be only a matter of guesswork, it is quite probable that the average is somewhere in the neighborhood of 5 or 6 per cent of the energy of the coal transformed into useful energy ready for distribution. So one can see that if it were possible to elevate the average efficiency to something near the maximum now attainable in steam plants, about three times as much energy would be available for the productive industries of the country.

One will find business men, however, making the statement that in order to attain these savings it will be necessary to put in new equipment, and that this is not the time for changes with the factories working at their maximum to supply the materials needed in the war. This is partly true, but there is hardly a manufacturing establishment in the country which cannot, with a certain amount of care and supervision in its furnace room, use much less coal and obtain much greater results.

Owing to the great abundance of coal here, in the past the manufacturer has paid but little attention to the amount of coal he burned or how it was burned. In addition, technical training in our colleges has, as a rule, placed relatively small emphasis on the principles and the processes of combustion, concentrating their attention rather upon the improvement of the engine. The more evident facts of combustion seemed so simple as to offer little inducement for an intensive study of the process, but, as a matter of fact, the burning of a fuel is by no means a simple process and the misconceptions that have resulted from a too casual study of the phenomena have led engineers to construct uneconomical and inefficient devices.

The nature of coal has also been misunderstood by many users. Coal is an extremely complex substance, behaving quite differently under different conditions of combustion, and as the United States is extremely rich in a great variety of mineral fuels, it would seem necessary that the furnace design should vary with the different fuels used.

The Bureau of Mines has for a number of years been engaged in studying these problems and has by this time completed a number of reports that tend to solve many of the difficulties met with in the burning of coal. These reports are not only of extremely great value to the engineers and firemen of power plants, but they are also a practical aid to the householder in keeping up his furnace in an economical manner. Many of the conclusions of the Bureau, as embodied in these reports, can be put into operation at once with a great saving of coal and without any expensive new equipment being installed.

Looked at in a broad way, it is not economical to transport high-grade coal through long distances into districts where fuels of lesser value are to be had in abundance, when, as a matter of fact, the cheaper fuels could be satisfactorily used if the user would show a little patience and gumption. The suitability of fuels for use in any locality is, therefore, a matter of public education in which the Bureau of Mines takes a deep interest. As an illustration, the substitution of coke for anthracite coal in many localities is very desirable on the score of economy, and the Bureau desires to stimulate the use of coke as a domestic fuel because of its cleanliness.

## MEMORIAL TO SILVANUS P. THOMPSON.

**Opportunity to Contribute for Purchase of Memorial Library Offered to American Electrical Engineers.**

A fund is being raised to purchase the very valuable scientific library of the late Silvanus P. Thompson, and to present it to the Institution of Electrical Engineers, as a memorial of his life and work, the library to be accessible to the public on the same conditions as the Ronalds Library of the Institution of Electrical Engineers in London. A committee of fifteen prominent scientists and engineers has been appointed in England, with M. W. Mordey acting as chairman, to carry out the plan and to raise funds for the purchase of the library, the price of which is $20,000.

An invitation to contribute to the purchasing fund has already been issued to the membership of the Institution of Electrical Engineers in Great Britain. The Thompson memorial library is to be presented to the Institution as a permanent adjunct to its electrical library.

In response to a suggestion received from the committee in charge of the plan, and with the approval of

the president and board of directors of the American Institute of Electrical Engineers, the above facts are presented to American Institute members, so that they may have an opportunity of contributing to the purchase fund and making still closer the fraternal relations of British and American electrical engineers.

The late Professor Thompson had so many friends, students and admirers in America and was known to so many electrical engineers by his extensive and classical publications on electrical science and engineering that the committee in England felt it would be only a matter of courtesy and sympathy to open the subscription list to the American Institute, of which Dr. Thompson was an honorary member. He was also one of the British delegates to the International Electrical Congress of Chicago in 1893.

Subscriptions to the Thompson memorial library fund may be addressed to F. L. Hutchinson, secretary, American Institute of Electrical Engineers, 33 West Thirty-ninth Street, New York City, who has kindly undertaken to receive and collect the same, and to forward them with the list of contributors to the British committee.

## LORD NORTHCLIFFE AND PARTY TALK ACROSS CONTINENT.

### Hear Roaring of Waves of Atlantic and Pacific Oceans Simultaneously—Other Significant Demonstrations.

A remarkable demonstration of long-distance telephony, which under present conditions is of peculiar significance, was held on Thursday, July 12, in New York on the occasion of the visit of Lord Northcliffe and his party as the guests of Theodore N. Vail, president of the American Telephone & Telegraph Company at the company's office, 195 Broadway. A point of historical interest was the listening by the distinguished visitor to the roar of the Atlantic and Pacific Oceans simultaneously. A telephone was connected to the transcontinental line reaching to San Francisco where the line had for the occasion been extended to a telephone transmitter on the shore of the Pacific at the Golden Gate. Another telephone was connected to a line extending to a transmitter on the shore of the Atlantic. Thus, by placing to his ear the appropriate telephone, Lord Northcliffe was enabled to hear with great distinctness first the roar of the waves on the Pacific shore and then the roar of the waves on the Atlantic, and then, with a receiver at each ear, to hear both at once. Never before, until this occasion, had the sounds of these two roaring oceans, separated by three thousand miles, been heard simultaneously by the ear of man.

Preceding this demonstration Major J. J. Carey, chief engineer of the American Telephone & Telegraph Company, conducted a continental roll call of engineers who were stationed along the entire line at 500-mile intervals for the purpose. One after the other was called in rapid succession, each answering to his name, the entire transaction requiring only a few seconds. This demonstration has deep suggestion in view of the part which the telephone will undoubtedly have to play in the present war. Each of the engineers stationed along the line might represent the commander of an army, commander-in-chief speaking instantly to any one or to all of these army commanders simultaneously.

Following this demonstration Lord Northcliffe talked with San Francisco and then all listened to patriotic music played in San Francisco.

A visit was made to the laboratories of the Western Electric Company, where luncheon was served. At the laboratories a model of the first telephone was exhibited, a crude wooden instrument with a large diaphragm. In the accompanying illustration of Lord Northcliffe and Mr. Vail the model is being presented the visitor as a souvenir of the occasion. A miniature model, not over one inch long, of the latest form of telephone instrument, was also presented to Lord Northcliffe. The tiny instrument exhibits wonderful workmanship and actually can be operated.

Lord Northcliffe and Theodore N. Vail—Presentation of a Model of the First Telephone at Mr. Vail's New York Office.

Lord Northcliffe and his party were greatly impressed with the demonstrations, particularly with the transcontinental telephony, as his familiarity with conditions enabled him to understand the almost insurmountable difficulties which American ingenuity had overcome in the construction of such a monumental system of communication. While talking to Superintendent Patten of the telephone company at San Francisco, Lord Northcliffe said: "There is something I want to say to you. When I last visited your beautiful country I found that you had great numbers of Britons and Scotchmen among your residents who still retained their allegiance to the king. I suggest that they get together for recruiting, and also for helping in the strict observance of the food regulations issued from Washington."

Among those present with President Vail, in addition to Lord Northcliffe's party, were:

U. N. Bethell, senior vice-president, American Telephone & Telegraph Company; N. C. Kingsbury, vice-president, American Telephone & Telegraph Company; J. J. Carty, chief engineer, American Telephone & Telegraph Company; B. Gherardi, engineer of plant, American Telephone & Telegraph Company; H. B. Thayer, president, Western Electric Company; H. A. Halligan, vice-president, Western Electric Company; F. B. Jewett, chief engineer, Western Electric Company; Newcomb Carlton, president, Western Union Telegraph Company; Hon. W. Murray Crane, of Boston; H. E. Shreeve, who heard the first words over the wireless telephone at Paris from Washington, D. C.

Lord Northcliffe was accompanied by Gen. W. A. White, head of the British Recruiting Mission in the United States, and his secretaries.

## NEW OFFICERS OF AMERICAN ASSOCIATION OF ENGINEERS.

### Convention Adopts New Constitution and Elects New Officers and Directors.

At the adjourned meeting of the annual convention of the American Association of Engineers, held at Chicago on July 13, the following officers were unanimously elected:

President: Edmund T. Perkins, consulting engineer and president, Edmund T. Perkins Engineering Company, Chicago.

First vice-president: W. H. Finley, chief engineer, Chicago & Northwestern Railroad.

Second vice-president: Isham Randolph, consulting engineer and president, Isham Randolph & Company, Chicago.

Directors for term of two years: Paul P. Stewart, treasurer and chief engineer, Ketler-Elliott Erection Company, Chicago; R. C. Yeoman, dean of engineering, Valparaiso University, Valparaiso, Ind.; W. W. DeBerard, western editor, McGraw-Hill Publishing Company, Chicago; C. A. Soans, with Affield, Powell, Graver & Affield, Chicago; H. G. D. Nutting, consulting engineer, Chicago; G. C. Dooge, designing engineer, American Bridge Company, Gary, Ind.

Directors for one year: F. H. Newell, consulting engineer and professor of civil engineering, University of Illinois, Urbana, Ill.; L. K. Sherman, president, L. K. Sherman Engineering Company, Chicago; H. W. Claussen, head of construction division, Engineering Bureau, City of Chicago; J. F. Gayton, president, Utilities Engineering Company, Chicago; A. D. Whipple, consulting engineer, Milwaukee, Wis.; A. P. Cunningham, engineering department, Illinois Central Railroad, Chicago.

Auditing committee: Samuel Morrell, G. A. Gaenslen, J. T. Mullin.

Several stormy sessions of the convention over the adoption of a new constitution were held; finally the organization placed the matter in the hands of Isham Randolph, W. H. Finley, R. C. Yeoman, H. G. D. Nutting and T. H. Williams, who succeeded in ironing out the difficulties and getting the proposed constitution adopted unanimously. The main provision of the new constitution is the enlargement of the board of directors from five to fifteen members, but the board may appoint five members to actively manage the affairs of the Association. A clause to include associates is provided in the constitution. This membership pertains to men who are not necessarily engineers but interested in engineering affairs and may be admitted up to 10 per cent of the certified membership.

A resolution was adopted forming a patriotic league of engineers, which provides for a census of engineers and to look after the dependents of enlisted men. Co-operation with other engineering societies is also to be fostered.

### Comment on Coal Agreement.

The *Press Bulletin* of the United States Chamber of Commerce, Washington, D. C., contains the following comments by Waddill Catchings, chairman of a committee of that body, relative to an agreement on coal prices:

"When the Secretary of the Navy recently asked quotations on coal for the Navy, a price of $2.95 was submitted although such coal was then selling at $4 or $5 per ton. Believing that the coal operators making the quotation had not made the full sacrifice necessary under the circumstances, the Secretary of the Navy commandeered the coal needed at $2.33 1-3 per ton, but these and other operators still charged the public $4 and $5 per ton, and even more.

"This is clearly an unsatisfactory situation, and the Coal Committee of the Council of National Defense, in the spirit of attempting somehow to meet the emergency, called a meeting of all bituminous coal operators to consider the matter. At this conference, Secretary Lane and Secretary Daniels set forth the situation that coal operators were making enormous profits at a time of great national sacrifice and suffering. The operators responded by agreeing to have prices determined on a basis of cost plus a fair profit after a Government investigation—and pending the determination of such prices they voluntarily agreed not to charge the public more than $3 per ton, a price far below those then prevailing. The operators were congratulated on their public spirit by Secretary Lane and the conference adjourned.

"Then, quite unexpectedly, the Secretary of War, as president of the Council of National Defense, wrote a letter sharply criticising the agreement and the action of the committee and operators. The full bearing of Secretary Baker's letter upon the operations of the Council and its committees is not yet clear."

**Old Central Station Shut Down.**—After having been in continuous use for more than thirty years, the old electric light plant at Uniontown, Ky., has been abandoned. The Kentucky Utilities Company, which some time ago purchased the property and franchise, is now providing service from Morganfield exclusively, where new equipment is being installed.

## NEWS NOTES

**Trolley Road Hauls Coal at Night.**—The suggestion which Henry L. Doherty made recently that traction lines be used during the night to assist in solving the freight problem, has been put into operation by the Hocking-Sunday Creek Traction Company, of Athens, Ohio. This trolley line is moving coal from mines along its tracks and is transporting quite a large tonnage every night.

**Doherty Safety Men Meet at New York.**—The midyear meeting of the members of the safety department of Henry L. Doherty & Company was held in New York City July 10, 11 and 12, various members of the department having come to confer with G. O. Smith, supervisor of safety of the Doherty organization. Among these were: H. L. White, traveling representative of the department; F. W. Wachter, head of the Eastern Ohio claim district, and R. S. Metzger, safety supervisor of the Toledo Railways & Light Company.

**Telephone Pioneers Cancel Convention.**—Announcement is made by Theodore N. Vail, president of the Telephone Pioneers of America, that the annual convention of this organization, which was to have been held in October, has been indefinitely postponed. In making this announcement, Mr. Vail states: "The imperative calls and necessities of the war in which our nation is now involved have taken many telephone men from their regular vocational duties, and it is more than probable that during the months to come many more may similarly be called away."

**Maps of Electric Lines Prepared.**—The United States Government through the War Department has been preparing a map showing the electric transportation facilities now existing in this country. It is believed that this work is to be utilized as a secondary basis for the national control of railways in war times, the idea being to relieve the steam roads of as much traffic as possible at points connecting with military depots, cantonments, etc. Utility men believe that the work will reveal some unusual facts in regard to the highly developed system of electric interurban railways which now cross-hatch the country. Furthermore, it is hoped that the work may lead to a consideration of freight carriage on these electric lines, and the substitution of electric trains for steam trains wherever possible.

**Electrification of Railway Yards in St. Paul.**—The Northern States Power Company has closed a contract for supplying power to operate electric locomotives to be owned by the Central Warehouse Company of St. Paul. The Central Warehouse Company will electrify several miles of switching track serving a number of buildings, including refrigerating plants, etc. This is regarded as the first step toward the electrification of the large Minnesota Transfer railway yards, as the Central Warehouse Company's trackage is an addition to the transfer district. The Central Warehouse Company plans to operate electric locomotives, replacing steam locomotives, and to thereby double its switching capacity of 150 cars per day, at the same time materially lowering the cost of operation. The initial installation will consist of a 500-kilowatt rotary converter which capacity probably will be later increased.

**Railway Telegraph Superintendents to Meet.**—Association of Railway Telegraph Superintendents will hold its next convention September 11, 12 and 13, at Hotel Raleigh, Washington, D. C. Matters pertaining to the handling of business resulting from present traffic pressure will be discussed. Several papers are to be read, as announced by W. L. Connelly, secretary, Gibson, Ind.

**Pacific Coast Electric Associations to Co-operate.**—At a recent meeting held by the Northwest Electric Light and Power Association, it was decided to co-operate freely with the Pacific Coast Section of the National Electric Light Association. Both these bodies are geographic sections of the National Electric Light Association and have many interests in common. Among special problems which concern both these sections are inductive interference, application of the National Electrical Safety Code, and matters dealing with hydroelectric power development.

**Efficient in the Face of Death.**—L. F. Larson was wireless operator on the American steamer *Orleans* when that ship was torpedoed by a German submarine on July 3. By remaining cooly in his cabin up to the last minute and sending out S O S calls, forty-six of the fifty men on the vessel were rescued. In this connection Capt. Allen Tucker of the vessel says: "He got in radio touch just as the stern began sliding under water. I ran in, pulled him out on deck and practically threw him overboard, knowing he could swim."

**Dinner in Honor of Enlisted Men.**—Officers of the Dayton (O.) Power & Light Company Section of the National Electric Light Association tendered a dinner on July 12 in honor of five employees of the company who have enlisted in the National Guard. President M. H. Wagner, of the Dayton Section, presided, with Thomas F. Kelly as toastmaster, and General Manager Hutchings and several officers were among the speakers. The employees honored were Charles F. Bell, Charles E. Collins, Frank Kendig, Howard Tanzey and John Carrothers.

**Electrical Engineers of Iron and Steel Industry.**—Association of Iron and Steel Electrical Engineers has announced the holding of its eleventh annual convention at the Bellevue-Stratford Hotel, Philadelphia, September 10 to 14, inclusive. The announcement sent out under authority of F. D. Egan, president, and J. F. Kelly, secretary, contains a request for suggestions as to details and arrangements concerning the convention. Wednesday, September 12, is to be devoted entirely to a patriotic program, which will include addresses by Army and Navy engineers on subjects vital to our industries. J. F. Kelly, secretary of the association, is connected with the National Tube Company, McKeesport, Pa.

**Government Nitrate Plants to Be Rushed.**—Secretary of War Baker has made brief anonuncement that Government plants for the electrical fixation of atmospheric nitrogen are to be erected and placed in operation at the earliest possible date. It is expected to spend about $4,000,000 for this purpose out of a total appropriation by Congress of $20,000,000. Mr. Baker stated that the plans now being worked on would not involve new water-power developments on account of the length of time required for the erection of hydroelectric plants. Further details have not yet been made public, but it is expected that power will be taken from existing plants whether they be operated by steam or water power.

# Notes on Commercial Practice

***New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity***

## BROOKLYN COMPANY MAKES RECORD GAIN IN NEW BUSINESS.

**Total of 18,982 New Customers Secured in First Half of This Year.**

That Brooklyn is rapidly being developed electrically is shown by the report of the commercial organization of the Brooklyn (N. Y.) Edison Company covering the sales for the first six months of the present year.

This report shows that contracts for 18,982 new customers were signed covering light and power customers. Of the power customers, 32,010 horsepower in motors were contracted for.

Electricity in the home was also materially advanced during the past six months; 586 old houses were rewired in Brooklyn, and 494 old stores rewired. If the number of contracts for light in houses and stores were placed on a candlepower basis, it is found that 17,713,440 candlepower in lights, with the new tungsten lamps, was contracted for.

Electrical appliances in the home, too, had their share in this remarkable development. Over 6,650 appliances were sold. In this number has been included over 1,500 electric irons, over 1,000 vacuum cleaners, 500 electric vibrators, 300 heating pads, etc.

In the power development, it is interesting to note the gradual replacement of independent power plants by Edison service; 37 independent power plants have been replaced with Edison service during the first six months of the year. These power plants include such large steam-driven plants as the Atlantic Hygeia Ice Company, the Empire State Dairy Company; Cowperthwaite & Company, F. Bishoff & Company, Boorum & Pease Company, and gas-engine plants such as installed in the Arthur Tickle Engineering Company and Sheffield Silver Company.

A large amount of additional power business was added to existing Brooklyn Edison power customers, the Bush Terminal alone taking nearly 4,000 additional, the Rockwood Company 1,000 horsepower and the Metropolitan Engineering Company 1,500 horsepower.

In the erection of new structures in Brooklyn, contracts were taken for over 1,200 new residences. The new Court and Remsen Building, Brooklyn's new 24-story office building which will be erected at the corner of Court and Remsen Streets, has signed for Edison service throughout. The new Peck Memorial Hospital to be erected on Crown Street has also signed for Edison service.

### Louisville Company Secures Contract for Army Cantonment and Other Desirable Business.

The Louisville Gas & Electric Company has secured contract with the Government covering 1,000 kilowatts of electric energy for the new army cantonment which is being erected south of Louisville, Ky. The lighting load will approximate 17,000 40-watt lamps for the buildings and the power load for pumping alone will be in the neighborhood of 100 kilowatts.

The commercial department of the company, during the week ended July 7, secured contracts for 93 customers with 58 kilowatts of lighting and 311 horsepower in motors. Included in the power business is 175 horsepower for the Kentucky Wagon Manufacturing Company, a particularly desirable piece of business because of its high load factor. The Ewald Iron Works is securing a new 20-inch muckmill and squeezer and will require a 1,000-horsepower motor for its operation. This business will be served by the Louisville Gas & Electric Company as soon as the installation can be made.

## ELECTRIC TRUCKS PROVE THEIR SUPERIORITY IN POSTAL TRANSFER SERVICE.

By Arthur Williams.

Twenty hours out of every twenty-four for six days a week and every week is the service record of the electric trucks of the fleet of the Postal Transfer Service, Incorporated, which handles a large part of the mail in New York City. The 47 electrics used by the company have this remarkable record to their credit, which clearly demonstrates the dependability of this type of vehicle. During the week days the garage takes care of them only four hours a day. For ten hours at a stretch the trucks are on duty, coming back after a 35 to 45-mile run for a two-hour stop while a new set of batteries is installed and the discharged ones put on charge. They have been doing this for three years and are giving satisfaction.

The electric is the only type of vehicle which can stand such grueling service. The gas cars used by the same company are only called upon to put in a ten-hour day, it being deemed the most economical method to send another gas car in its place after the single run is completed. But the electric has so few mechanical troubles that it can be kept on the go day and night and be none the worse.

Henry Rowley, president of the Postal Transfer Service, is quoted as saying that with gasoline at 16 cents per gallon, the electric and the gas truck were nearly on the par in operating costs. Above this price the electric is always cheaper to run. With gasoline at 23 and 25 cents a gallon as at present, the economy of the electric vehicle is impressive.

The electric mail trucks are operated almost entirely in congested sections of the city below Forty-fifth Street to South Ferry. It is in crowded traffic that the simplicity of control of electrics has prevented many accidents and with no gears to shift, the cars can get away on the instant and more than compensate for the normal superior speed of the gas car.

## KEEPING UP ENTHUSIASM IN RANGE CAMPAIGN.

### Texas Central Station Uses Bi-weekly Stimulator to Accomplish Result.

In addition to publishing a monthly house organ to breed a spirit of closer co-operation among the employees and to keep them posted on personal matters and company proceedings, the advertising department of the Texas Power & Light Company is getting out a series of bi-weekly stimulators which are taking root and producing worth-while results.

It is safe to say that the eyes of the entire central-station industry in the United States are focused on the drive being made by the Texas Power & Light Company to sell the idea of electric cooking to 2,000 of its customers scattered over the 103 small and medium size towns and cities which it serves.

The extremely gratifying results that are being shown are due to the effective intensive work of the salesmen stationed in the various districts. These men are really experts and are selling the idea of electric cooking and not electric ranges. Their enthusiasm over the work with its almost boundless limitations is in a great measure accountable for the success attained so far.

The stimulator, which is published primarily for the benefit of these men on the firing line, does its share of keeping the "scouts" keyed up and going at top-notch speed.

This little breath of enthusiasm is called "Heat-Chasers" and as some of its space is devoted to the summer campaign on "All-Green" electric fans, the name is very well taken.

"Heat-Chasers" is a little two-leaf pamphlet printed on all four pages. The front page is given over to an editorial dealing with some timely and pertinent subject. These editorials are written with the idea of getting the men to thinking farther ahead and planning new ways and means of future activity. One, for instance, in dealing with the now-a-day subject of food conservation and waste prevention, tells how the electric range, in preventing shrinkage of foods, is linked up with this great national move to conserve the nation's resources. Another deals with intensive cultivation of present electric distribution systems as compared with intensive cultivation of the soil and intensive work in factories and stores to increase the production and business without laying out money for extensive improvements and enlargements. Other editorials deal with similarly pertinent topics of the day. They are written in plain English and, in a measure, are educational but easily intelligible.

The two inside pages of "Heat-Chasers" consist of a series of ideas of how hard customers were won over and how special stunts were perpetrated to get the business. In other words, a clearing house of sales ideas is maintained on these two inside pages so that if the fellows working in north Texas towns unearth a scheme that sells ranges, "Heat-Chasers" can publish it and the men in south Texas towns likewise profit by it, and vice versa.

To illustrate, one of the boys who sold a range to one of the directors in a bank in the town in which he was working brought an electrically cooked cherry pie around to the same bank and had business suspended while he dished it out to the other officers and employees and incidentally took contracts for four more ranges.

Another "live-wire-guy" secured permission from a lady to invite the neighborhood around to see the installation of the first electric range in this representative home. A little talk and demonstration right then and there promptly sold the neighborhood the idea of electric cooking and with two closed contracts and many live prospects this salesman pulled off a stunt that was worth while bringing to the attention of the whole crew through the medium of "Heat-Chasers."

Other such worthy ideas were circulated with the result that all the boys are getting the benefit of each other's experiences and are cashing in on them.

The heavy ammunition of "Heat-Chasers" is served on the last page in the form of campaign statistics. It is really this page that creates the friendly rivalry among the men and keeps them hot on the trail as the one at the top of the list occupies a most enviable position.

Page Four THE HEAT-CHASERS

**Range Campaign Statistics**

**As of July, 5, 1917**

| Standing | District | Salesman | Total Range Sales Allotment | To be Sold during 1917 Campaign | Range Contracts Secured | Sales Points Earned (basis Contracts Secured) |
|---|---|---|---|---|---|---|
| 1 | Denison | H. H. Stanfield | 20 | 17 | 9 | 529.20 |
| 2 | Tyler | S. J. Fechenbach | 55 | 52 | 23 | 442.75 |
| 3 | Eagle Pass | A. B. Hillan | 95 | 75 | 32 | 427.20 |
| 4 | Terrell | Harry Hind | 96 | 96 | 37 | 385.39 |
| 5 | Commerce | H. L. Cadwallader | 143 | 132 | 49 | 370.93 |
| 6 | McKinney | Harry Hind | 185 | 170 | 63 | 370.56 |
| 7 | Cleburne | H. L. Barnes | 82 | 77 | 27 | 351.00 |
| 8 | Hillsboro | L. D. Wittkower | 266 | 249 | 86 | 344.86 |
| 9 | Ennis | Otis Wilbor | 224 | 214 | 73 | 340.90 |
| 10 | Sherman | H. H. Stanfield | 24 | 21 | 7 | 333.20 |
| 11 | Bonham | C. W. McCutcheon | 150 | 137 | 42 | 305.76 |
| 12 | Waxahachie | J. H. Simpson | 200 | 189 | 49 | 258.72 |
| 13 | Taylor | Jeff Murphy | 308 | 261 | 62 | 237.46 |
| 14 | Sweetwater | H. A. Spencer | 246 | 219 | 50 | 228.50 |
| 15 | Temple | G. M. Depuy<br>R. W. Snyder | 356 | 305 | 65 | 213.07 |
| 16 | Palestine | S. J. Fechenbach | 50 | 48 | 9 | 187.29 |
| 17 | Brownwood | R. B. Clarkson | 115 | 109 | 15 | 137.55 |
| 18 | Paris | H. V. Applebaugh | 50 | 47 | 5 | 106.50 |
| 19 | Gainesville | H. H. Stanfield | 19 | 16 | 1 | 62.50 |
| 20 | Waco | H. L. McLean | 41 | 41 | 0 | 0. |
| 21 | Wichita Falls | Manager | 51 | 43 | 0 | 0. |
| | | | 2776 | 2518 | 704 | 5633.34 |

| | |
|---|---|
| March 1st to Sept. 30, 1917 | 214 days |
| Days of campaign passed to July 5th | 127 days |
| Per cent of campaign period passed | 59 |
| 1917 range allotment | 2000 |
| Ranges sold March 1st to July 5th | 704 |
| Per cent of range allotment sold | 35 |
| Ranges yet to be sold | 1296 |
| Campaign days remaining | 87 |

MUST GO at rate of 14 per day, or 98 per week.

**Competitive Statistics on Range Campaign.**

When the campaign plans were first laid, a bogey was declared for each district and a system of sales points worked out on a basis of 1,000 points total; that is, each range sold was to count a certain number of sales points, this number being determined by the bogey for each district.

Records of sales are determined from reports sent in and it has developed that, aside from stimulating the men to work harder to sell more ranges, reports have been sent in more promptly and carefully made out so as to give the men the benefit in the percentage column of every contract secured to the last minute. This has facilitated the statistical work in the commercial department as delinquent reports are reduced to a minimum and all data are available for compilation as soon as the week's business is over. An illus-

tration of how these campaign statistics are compiled and printed is shown herewith.

While "Heat-Chasers" is primarily for the salesmen, it is nevertheless distributed among all the employees of each district and these employees, consisting of linemen, meter readers, clerks, collectors and construction men, are all working, pulling together, keeping their eyes and ears open for hints and tips that will help put their salesman on top. They want him on top and they watch the percentage column closely.

One of the linemen has a tip for his salesman every time he meets him. If he has no tip and sees the salesman coming down the street, he ducks around the corner or down a side street, as he doesn't want to be caught without a suggestion for an opportunity to help along. The result is that he usually has a tip and is encouraged when the salesman tells him the next day that, thanks to his observation, another contract was closed. This is real co-operation.

In distributing "Heat-Chasers" around his office, one of the managers in a district town uses a "pointing finger" rubber stamp. He stamps the statistics column once with the finger pointing to his district's place in the list and then again with the finger pointing at the top of the list. He then writes on each one, "You can help us get on top," and sees to it personally that every employee gets a copy. He also sends copies to the wives of the married employees and to the parents of the young men and women in the office. In many instances these people ring him up and ask how their boy or girl or husband is helping in the big drive. Other district managers, having absorbed this hunch through "Heat-Chasers," are doing likewise and the ranges are going.

Aside from establishing a precedent for new-business aggressiveness, the Texas Power & Light Company is developing a commercial organization of trained men that will be able to take hold of any sort of new-business venture and "put it across." They are being developed with the one big idea of rendering a service and of educating the public, with whom they constantly come in contact, up to a proper appreciation of the comforts, conveniences and economies that go hand in hand with this service.

## Selling Incandescent Lamps in Brooklyn on a Merchandising Basis.

Prior to January 1, 1917, the Brooklyn (N. Y.) Edison Company supplied incandescent lamps to its customers on a free-renewal basis. Since that time, however, no lamps have been supplied free on the contracts, each customer being required to pay the full list price for all mazda lamps, no carbon lamps being supplied at any price.

This was a radical step for a large central station to take and it was necessary to safeguard the company's revenue by seeing to it that all new, as well as old, customers had a full equipment of lamps.

Strict rules were laid down for the salesmen when signing the regular lighting contract to secure an order from the customer for the required number of 50-watt mazda lamps. The printed lamp order was made out for "50-watt lamps" in order that the suggestion would be there to use that size lamp rather than a lamp of lower wattage.

These orders from new customers are coming in quite regularly now, but the problem that confronted this company was to keep the sockets of present customers filled to a maximum. Accordingly a canvass of present customers was inaugurated by special salesmen in each branch office district. Each of these salesmen spends his entire time canvassing from customer to customer making an endeavor to secure renewal orders.

He is provided with a specially designed case about the size of an ordinary suit-case in which there are eight lamp sockets filled with various sizes of Edison mazda lamps. A loose cord is provided so as to demonstrate the lamps in his case.

This canvass has been very successful and a prize is now offered weekly to the salesmen in each district who procure the greatest number of lamp orders.

Another plan recently inaugurated by the company is a telephone canvass for lamp orders. In each office of the company a clerk provided with a list of customers and their telephone numbers calls the customer and states that the lamp wagon will be in their vicinity the next day and inquires whether they need any new mazda lamps. These telephone calls are made between 10:30 and 1 o'clock in the forenoon and 6:30 and 8:30 in the evening.

That these two methods of lamp merchandising have proven successful is evidenced by the following figures:

*Salesmen's Canvass Record* (*6 days*): 204 orders; 2,412 lamps; $841.81. 811 calls.

*Telephone Canvass Record* (*10 days*): 732 orders; 6,030 lamps; $2,024.88. 3,316 calls.

These figures show that out of 811 calls made by the salesmen over 25 per cent resulted in orders and of 3,316 telephone calls over 22 per cent resulted in orders.

**DEFERRED PAYMENT LAMP ORDER**

Date.....191...

Edison Electric Illuminating Co. of Brooklyn,
360 Pearl Street, Brooklyn, N. Y.

Please deliver { .....clear / .....frosted } 50 watt-Tungsten (Mazda) lamps

.....

as per your price schedule for use at premises.....

and for which I agree to pay the sum of.....in.....monthly installments with the bills for current.

Customer's Signature.....

Lamp Order Blank Used in Brooklyn.

## Manufacturer's Customer Insists on Central-Station Service for Factory.

The Sandusky Gas & Electric Company, Sandusky, O., has made contracts with the American Crayon Company for furnishing its entire factory-lighting service, amounting to 50 kilowatts. Since the Sandusky company procured a contract in the fall of 1915 for breakdown service with the American Crayon Company, the load has gradually been coming over to central-station power. One of the important factors which induced the Crayon company to purchase central-station power was the fact that a purchaser of a large part of the output of a certain one of its departments insisted that more reliable service be installed before he contracted with the Crayon company, thus bringing out forcibly the reliability of service obtainable from the central-station over isolated-plant service.

# Electrical Construction Notes

***A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment***

## POTENTIAL GRADIENTS ON SERIES LIGHTING CIRCUITS.

**Tests of Importance to the Operating Man Made at Lincoln Park, Chicago.**

Engineers of the Electrical Department of Lincoln Park, Chicago, under the direction of C. H. Shepherd, electrical engineer in charge, recently made several interesting tests to determine potential gradients and electrical center on a series boulevard lighting circuit with its last lamp six miles from the switchboard.

This circuit has the following equipment:

One 37.5-kilovolt-ampere Moloney transformer, single-phase, 60-cycle, 12,000-volt primary, 2,000 to 5,000 volts secondary, regulated by one 50-light Western Electric induction regulator at 7.5 amperes, with necessary disconnecting switches, oil switch, instrument transformers, etc.

104 type C Mazda lamps, 400 candlepower, 15 amperes.

Two Kuhlman series-multiple transformers, 7.5-ampere primary, 15-ampere secondary.

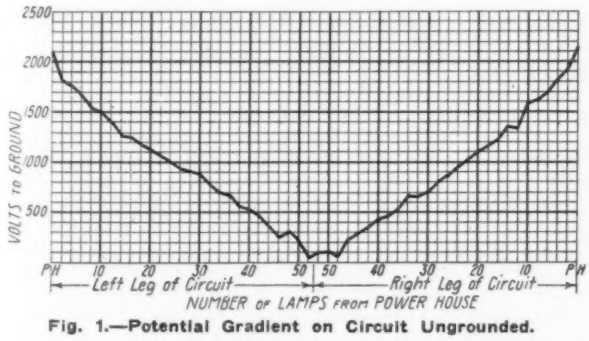



**Fig. 1.—Potential Gradient on Circuit Ungrounded.**

102 Westinghouse compensators, 7.5-ampere primary, 15-ampere secondary.

63,360 feet No. 6 solid, paper-insulated, lead-covered, single-conductor cable.

8,440 feet No. 6 solid, rubber-insulated, triple-braided cable.

71,800 feet is the total length of the circuit.

Inherent power-factor of compensator, 97.5 per cent.

Inherent efficiency, 93 per cent.

Inherent power-factor of transformer, 99.5 per cent.

Inherent efficiency of transformer, 94 per cent.

One test was made at the station with the following results:

Ground at station on left side of circuit, pressure across circuit 2,840 volts.

Ground at station on right side of circuit, pressure across circuit, 3,440 volts.

Potential across circuit without ground, 3,540 volts.

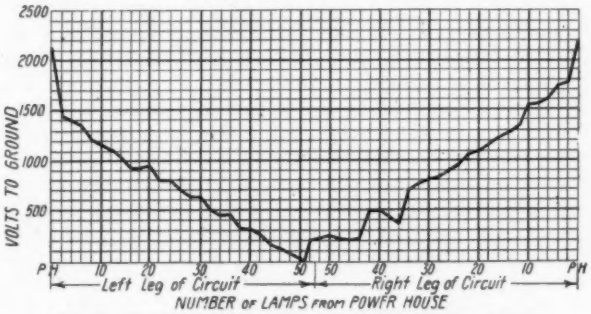



**Fig. 2.—Gradient With Center of Circuit Grounded.**

Potential to ground on left of circuit, no ground on circuit, 1,760 volts.

Potential to ground on right of circuit, no ground on circuit, 1,740 volts.

This clearly shows that with one end of the circuit grounded at the power house, the potential to ground is approximately 100 per cent greater at the other end than when the circuit is operated ungrounded.

Readings were then taken from line to ground at each lamp along Sheridan Road from Devon Avenue to Crescent Place, with the result that the potential gradually increased from 50 volts at the center of the circuit to 2,160 volts to ground on left and 2,140 volts on the right side of the circuit. The end or physical center of the circuit was also thereby apparently proven to be its electrical center. The lamps are alternated or staggered on the cable, both legs of the circuit being run in the same non-magnetic conduit. The potential across the circuit at the switchboard was 3,500 volts and the highest potential to ground was at the same point with a value of 2,160 volts, while at the lamp nearest the power house, which was approximately three miles distant, the potential to ground was 1,900 volts.

These tests are shown in graphical form in the accompanying illustrations.

By reference to Fig. 1 it will be seen that the potential gradient is almost uniform, due to the fact that there is no ground on the circuit, allowing the neutral

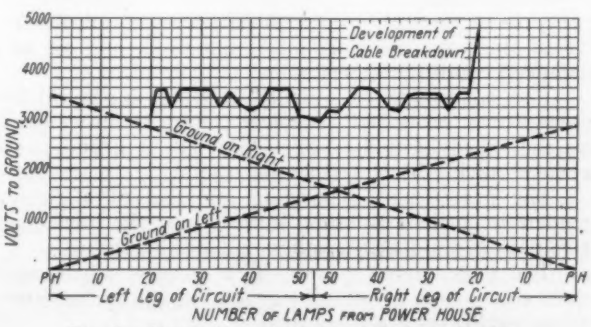



**Fig. 3.—Circuit Ungrounded and Open at Center.**

point to shift position to compensate for the changes in reactance on the circuit due to lamp burnouts, regulator movements and electrostatic conditions throughout the entire length of the circuit.

Reference to Fig. 2 shows that with the apparent electrical center of the circuit grounded, the potential gradient is unbalanced and shows a lack of uniformity, due to the fact that the neutral point is fixed by being grounded and the former flexibility and freedom for adjustment of the ungrounded circuit in response to changes of electrostatic and electromagnetic conditions is thereby seriously hampered. The unbalance due to action of the regulator and to changes in electrostatic capacity due to variations in the specific inductive capacity of the various dielectrics used along the circuit are plainly apparent.

It was expected that the introduction of a ground at the apparent neutral point where a potential of only 50 volts to ground existed would reduce the potential at that point to zero and accordingly reduce the potential to ground all along the circuit. The ground was not placed at the electrical center, however, as it turned out, for the reading at the supposed middle lamp rose from 50 to 199 volts, while the potential at a lamp three posts further south fell to zero. The maximum potential to ground on the circuit rose from 60 to 20 volts at different points. This apparently showed that the placing of the ground did not reduce the maximum potential to ground, due possibly to electrostatic conditions.

The placing of the ground, however, does give rise to a condition which makes trouble "shooting" easy. With a ground at the electrical center of the circuit, it is apparent that, should another ground come onto the circuit, the lamps between the two grounds will not burn. It is therefore very easy to locate the second or accidental ground which is the cause of the trouble.

In order to get an idea of the relative values of the inductance and capacity of the circuit, the cable was opened at Devon Avenue and a potential reading taken at this point, a value of 4,500 volts being obtained across the ends of the circuit. Readings to ground were then taken at each lamp toward the power house until trouble developed on the circuit at a little over 3,000 volts, showing that at this low potential to ground a breakdown is possible under open circuit. The exact voltage conditions causing the trouble were not determined at the time, due to lack of instruments. From all appearances, a great rise of pressure occurred, possibly due to a condition approximating resonance.

Pending further investigation, certain conclusions appeared evident. In the first place better voltage conditions, less dielectric strain to ground and greater flexibility of adjustment appear when operating the circuit ungrounded.

Grounding apparent electrical center causes no apparent release of electrical strain nor decrease of pressure to ground, but on the contrary the uniformity of the potential gradient is impaired, and an unbalanced condition appears.

The advantage of quickly locating a ground by means of a grounded electrical center is outweighed by the disadvantages above stated, as a ground can always quickly be placed at the station.

The practice of grounding one end of a circuit evidently makes a large increase in the dielectric strain to ground at the other end of the circuit.

The ungrounded circuit offers greater advantages than any system of straight grounding, as far as operating conditions are concerned.

## Simple Visual Test Aids Installation of Low-Potential Signal System.

By John A. Wever.

While installing a low-potential nurses' call system in a hospital a large number of fixture wires were run in metal molding. During the first part of the job we followed the plan of capping up a long run of molding and then throwing on the "juice" for a test.

Owing to the crowding necessary to get the wires in the molding, considerable loss of time was experienced from clearing numerous "shorts" and "grounds" which were due to the insulation being damaged by being wedged between backing and capping while capping up.

As there was still a large amount of molding to be run, we decided to put an alarm on the job to sing out the moment any trouble came on while we were capping up. As the noise from a bell and battery test would disturb the patients, we selected a lighting fixture at the center of the hall which was easily visible from any point of the molding run and made a flying tap to one of the sockets which was hooked up in series with the molding backing and one end of all the wires which were to be laid in the molding.

Of course, the lamp would light the instant a ground or short came on and would stay lit until the trouble was cleared. When the lamp lit, we knew the trouble was right under hand and was easily cleared before proceeding to cap up further. This enabled us to complete the remainder of the work with a great saving of time and patience.

## Among the Contractors.

The Edward Joy Company, Syracuse, N. Y., has received a contract totaling $3,761 for electrical work in the new Edward Smith School to be constructed by the city.

The Walker Electric & Plumbing Company, Columbus, Ga., has received a contract for electrical and other work at the new cantonment at Columbus, to cost about $400,000.

Hatzel & Buehler, Inc., 373 Fourth Avenue, New York, have been awarded a contract for electrical work, at a cost of $12,889, in the new public school to be erected on West Forty-eighth Street, Bayonne, N. J.

Wm. H. Carlsen and H. E. J. Glienke, of Chicago, have formed a partnership under the firm name of Wm. H. Carlsen Company and will engage in general electrical contracting. Headquarters are located at 4920 Cortez Street, Chicago.

NePage, McKenny Company, electrical engineers and contractors, with offices in Seattle, Portland and San Francisco, report business active. This company has a contract for the electrification of the Oregon-Washington dock, Seattle. The San Francisco office has secured a contract for the electrical equipment in the women's dormitory, Stanford University, at approximately $25,000; also a contract for similar work in the Judson Iron Works at Oakland, amounting to about $30,000; and is installing electrical equipment for the Chevrolet Motor Car Company at Oakland, at $60,000.

# USEFUL WIRING HINTS

*A collection of some short-cut or otherwise valuable suggestions which, though not entirely new, are not as well known by wiremen as they deserve to be. Most of these suggestions have been submitted for publication as "Dollar Wiring Kinks," which department is intended for new and original ideas only and will reappear soon.*

**Cleaning Stranded Cable.**—In soldering terminal lugs to heavy stranded cables a poor job is often obtained because the bared end of the cable was not properly cleaned. To do this with a knife is both tedious and ineffective unless one has plenty of time to scrape the insulation thoroughly from between the strands. I have found that use of a stiff wire brush, such as a file card, is best and quickest for this purpose. It should be brushed in several directions, but especially in the spiral lay of the strands.

B. STRATTON.

**Simple Extension Bit.**—The wireman frequently needs an extension bit for drilling deep holes or holes exactly in line in several joists. I recently made a handy extension bit out of an old brace that I found in the shop. It was first straightened out and the upper end then cut off, upset and filed square with a taper to correspond to an ordinary bit shank. It was easily made and found to be very useful.

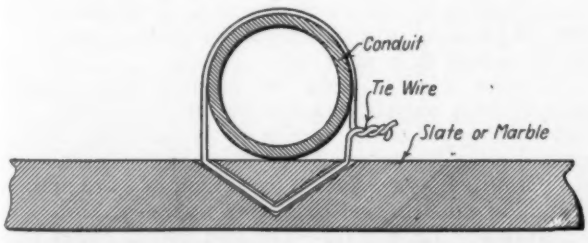
THOS. ST. CLAIR.

**Temporary Substitute for Pendent Switch.**—On a temporary lighting installation several pendent switches were desired to control a number of high ceiling lights, and as none were at hand ordinary key sockets were converted into pendent switches by simply screwing a fuse plug into them. Furthermore, these pendants gave proper fuse protection to the lamps they controlled and the fuses were readily accessible for renewal. Although this scheme would not be considered good practice for permanent work, it certainly filled the bill for the temporary class of work on which it was used. J. A. WEVER.

**Twisting Wires by Means of Drill.**—Occasionally the wireman is called on to twist together a pair of separate wires. To do this by hand takes much time and makes a poor job if considerable length of wire has to be twisted. For this purpose I use an ordinary hand brace, clamping one end of the wires in place of the bit and fastening the other end in a vise or clamp. In this way the wires are twisted evenly and quickly. H. T. NICHOLS.

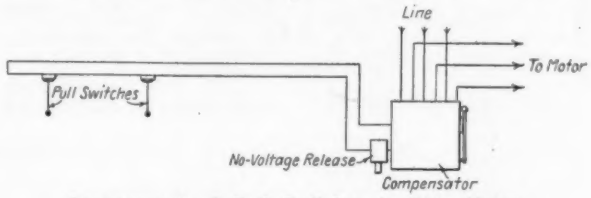
**Mounting Conduit on a Panel Without Pipe Strap or Bolt.**—When occasion arises that conduit, metal boxes or other objects must be mounted on a slate or marble surface, and where other means of fastening are not available, the method herewith described can be successfully used: With a small twist drill, two holes are carefully drilled at an angle so that they meet. Then the object is secured by means of a tie-wire fished through the holes. This is clearly depicted in the cross-sectional view given in the sketch.

J. A. WEVER.




**Method of Mounting Conduit on Panels Without Showing on Front Surface.**

**Simple Motor Release from Distant Points.**—It frequently is necessary for the operator to stop the running of a motor while he is stationed some distance away from the switch or starter. A very simple method and one that is entirely satisfactory for permitting stopping control of the motor from distant points is obtained as shown in the accompanying sketch. This can be applied to the low-voltage release coil of a compensator or induction-motor starter, or to the low-voltage release of a direct-current motor starter. It consists simply in the extension of the low-voltage release circuit in which are placed conveniently one or more pull switches. For instance, if these switches are installed in overhead positions near points from which the motor should be stopped quickly in an emergency, the pull chain is convenient to the operator. This arrangement has proved especially helpful around woodworking machines.




**Arrangement of Pull Switches to Stop Motor.**

JOHN W. MELHORN.

**Fishing for Wall Switches in House with Hardwood Floors.**—In wiring old houses where there are finished hardwood floors on both the first and second floors, and it is desired to have switches put in for center lights without taking up the hardwood floors, I have found the following scheme useful: Get a thin fish pole, cut a small hole at the fixture outlet so that the canopy will cover it, stick the thin end of pole in one of the links of the fish chain, put a weight of some kind on end of chain and push pole and chain over to the partition; the weight pulls the chain down. Then withdraw the pole, go to the basement, fish out the chain and run the wiring for the switch wherever it is wanted. M. BRAUN.

**Reliable Way for Bending a Fish-Wire Hook.**—Whenever I have a long, hard pull of wire through a run of conduit, I make certain that the hook end of the snake is in proper condition for the pull. I anneal the piece of fish-wire by sticking the end into a pot of red-hot lead which heats the wire uniformly. Then I bend a neat hook quickly and let the end cool in sawdust. When I am pulling in a long run of wire I do not have to worry about the hook end opening and releasing the wire that is being pulled in.

M. J. MORIARTY.

**Locating Outlet Boxes in Concrete Construction Work.**—In concrete construction work considerable trouble is sometimes caused by the concrete flowing under the outlet boxes while it is being poured into the forms. This covers up the box and when the form is removed the box cannot be seen. Considerable time is, therefore, wasted in locating the boxes. I have found that by boring a one-inch hole in the form where the box is to be set, this trouble will be entirely eliminated.

G. D. GILPETHER.

# National Association of Electrical Inspectors

WASHINGTON DEVEREUX, President, 131 South Fourth Street, Philadelphia, Pa.
JOHN KELLY, JR., Vice-President, Camden, N. J.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.

R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

*Executive Committee*
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, J. C. Digby, British Columbia.
A. W. Hopkins, L. N. Heebner, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
H. S. Wynkoop, M. L. Pomares, New York City.
B. C. Hill, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee, according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

### GROUND AND SERVICE WIRES IN SAME CONDUIT.

*Question 344.*—Would it be permissible to put the ground wire of a secondary system in the same conduit with the light and power service wires, provided the conduit used is large enough to hold all the wires?

*Answer* 1 *(O)*—The Code contains no specific rule against doing this, but on the contrary recommends conduit as one means for protecting the ground wire against mechanical injury. It should be noted, however, that the ground wire should be kept outside buildings so far as possible, and the running in the service conduit would in many cases violate this provision.

*Answer* 2 *(T)*—There is no specific rule to prevent it.

*Answer* 3 *(R)*—I should say yes, in this territory, at least.

*Answer* 4 *(P)*—I see no objection to this practice. Unquestionably these wires are all part of the same system.

*Answer* 5 *(F and G)*—The ground wire could certainly be installed in the same conduit as the service wires. There is no possible action to be anticipated which should prevent it.

*Answer* 6 *(A)*—I should hardly consider it wise to do this. A ground wire should be independent of all other wires.

*Answer* 7 *(H)*—I should say emphatically no. The ground wire is to protect the installation and people using it from transformer breakdown, crosses with high-potential wires outside building or lightning. That being true it would seem as though either of these three troubles would not be impossible if the wire were run in conduit with the circuit wires of the building.

*Answer* 8 *(C)*—Ground wires should never be run in the conduit with other wires; ground the conduit to the ground wire.

*Answer* 9 *(E)*—There is nothing in the Code to prevent running it this way, but it goes without saying it is extremely poor practice.

*Answer* 10 *(M)*—Yes. The Code contains nothing to prevent it.

*Answer* 11 *(K)*—Yes. If Code insulated wire is used.

*Answer* 12 *(N)*—There is nothing in the Code to prevent this. The ground wire is indeed nothing but a part of that service wire to which it is attached. One can imagine the service conduit entering a wall immediately beside the water pipe, and being broken by a condulet fitting, the service wire emerging through one hole in the porcelain cap, being clamped direct to the pipe and reentering by the other hole in said cap.

---

### SECURING GROUND WIRE TO BUILDING.

*Question 345.*—Rule 15*e*, last part of first sentence, reads "but may be directly attached to the building or pole by cleats or straps or on porcelain knobs." The question has been raised as to the securing of the ground wire to a building by means of metal straps; would this be proper under the Code?

*Answer* 1 *(O)*—The rule does not specify material for straps, hence metal straps should be approved, if they secure the wire in a proper manner without kinking or injuring it.

*Answer* 2 *(B)*—In my opinion straps should not be used, because the rule referred to also states "staples should not be used," and I interpret this to mean metal staples or straps.

*Answer* 3 *(R)*—The ground wire should be as carefully insulated and protected as any other part of the system. Should the ground connection become defective, this wire has the same potential to earth as the secondary to which it is attached. It should therefore be properly insulated from the walls of any hazard to which it is attached.

*Answer* 4 *(P)*—Rule 15*c* requires that ground wire be kept outside building so far as possible, but may be strapped to the outside of the building. If the ground wire is run inside of the building straps are not permitted, as the fourth paragraph of 15*g* requires insulation equal to that of a circuit wire.

*Answer* 5 *(F and G)*—The rule quoted states that ground wire may be attached to building or pole by

cleats, straps or porcelain knobs. This appears to permit the use of straps of metal or other suitable material, or insulation by porcelain knobs if desired.

*Answer* 6 *(A)*—It seems to me that porcelain would be the proper way to fasten the ground wire on a building. Iron straps would be a good jumping-off place for lightning.

*Answer* 7 *(H)*—There is a Code provision which states that wire shall not be fastened with metal straps or double pointed tacks, and there seems to be no good reason why that provision should not apply to the ground as well as the circuit wire.

*Answer* 8 *(C)*—I can see no objection to using straps. They are probably safer than insulators, provided the wire is *effectively* grounded; if not, would advise that ground wire be perfectly insulated from building.

*Answer* 9 *(E)*—I should say metal straps certainly were not intended for use on buildings, but may be used on poles.

*Answer* 10 *(M)*—The wording of Rule 15*e* seems to be perfectly definite, and I should say it is clearly the intent of the Code to allow the ground wire to be secured to building by metal straps.

*Answer* 11 *(N)*—This section should be read in connection with Rule 15*g*, fourth paragraph. It will then be obvious that the straps are only for use on the outside of the building, and then (taking into consideration the fine-print note) not within seven feet of the ground level.

*Answer* 12 *(K)*—No. The Code treats secondary ground wires as though they were at full line potential at all times.

---

GROUNDING FOR WIRELESS TELEGRAPH APPARATUS.

*Question 346.*—Would not the use of No. 6 wire for the ground on wireless telegraph apparatus prove as beneficial as the No. 4 provided by Rule 86 at present?

*Answer* 1 *(O)*—No. 4 wire was probably specified for the reason that a larger capacity than No. 6 was thought desirable. It should be noted that a 100-ampere switch is required.

*Answer* 2 *(T)*—I should hardly consider a No. 6 as beneficial as a No. 4.

*Answer* 3 *(R)*—This is evidently a lightning protection, and it is a matter of opinion fundamentally. Some engineers consider a No. 16 enough. The Code says No. 4, so we demand it.

*Answer* 4 *(P)*—Rule 15*d* requires for grounding a No. 6. Rules 27*c*, 28*f* and 86*a* call for No. 4. The discrepancy is probably purely accidental and will probably be adjusted in the near future. In my opinion it is relatively immaterial which is finally fixed on.

*Answer* 5 *(F and G)*—Inasmuch as No. 6 is deemed a sufficient size for grounding secondary alternating-current systems, it would appear quite large enough for grounding the aerial of a wireless set.

*Answer* 6 *(A)*—I think this No. 4 being left in when the Code was last revised was an oversight. We allow No. 6 everywhere for this purpose today.

*Answer* 7 *(H)*—I think grounding of this sort of apparatus requires very large wire and should say *no* to this question.

*Answer* 8 *(C)*—The No. 4 wire will no doubt give better protection.

*Answer* 9 *(E)*—I feel that a No. 6 would give all necessary protection. I think the No. 4 remained in at the last Code revision simply because no one raised the question at the time No. 4 was changed to No. 6 for secondary grounding.

*Answer* 10 *(M)*—Yes, of course, it would.

*Answer* 11 *(K)*—Yes, if the combined area of the aerial conductors was not greater than No. 6.

*Answer* 12 *(N)*—Yes, it most certainly would. After all, in this sort of protection it is surface that counts, the lightning discharge does not penetrate the wire to any extent.

Last summer at my place on the Penobscot, I had an aerial with one end 5 feet above the ridgepole of my house, the other at the top of a 40-foot flagpole. It was made of six No. 12 magnet wires spaced 2 feet apart and was 75 feet long. For the ground wire all I could get was a No. 8 rubber-covered; it led down the pole, serving for a lead into the set which was in a tent at the foot of the pole. Here it ended at the center of a double-pole double-throw 30-ampere switch, the two blades in parallel. One end went to the set, the other outside the tent and down a 25-foot well, hanging bare 6 feet into the water.

One afternoon we had one of the worst storms I ever experienced. We had 47 lights broken by hail, and at my father-in-law's house (the next one) where we happened to be when it came up, they lost 65. We were in plain sight of my house at a distance of about 400 yards. We distinctly saw nine direct bolts taken by the aerial, and between times (at the height of the storm it was very dark) the entire aerial was surrounded by corona and brush discharge.

As careful examination afterward as I could make showed not the smallest trace of trouble anywhere except that in places the braid was loosened and the rubber separated from the wire in a number of inch-long places. On lowering the aerial we found a considerable number of minute pinhead marks of burning on the copper, but nothing serious. As soon as the storm had passed, and it lasted nearly two hours, on throwing over the switch the set was found working perfectly, for we picked up *N A D* almost at once.

---

## Advocates the Resumption of Custom Flour Mills in Missouri.

The Public Utilities Commission of Missouri is seeking to attain a maximum use of the state's energy sources from the standpoint of power economy, and the State Board of Agriculture is approaching the subject from the standpoint of maximum food production and economy of distribution of food. The Board is planning a campaign for the restoration to service of many idle flour mills, and a resumption of the old-time practice of custom grinding of grain. A generation ago, no farmer thought of selling grain until he had taken enough to the mill to have a sufficient supply of meal and flour ground for his own uses. The exploitation of hard wheat flour and its extended use in Missouri has been one cause of the farmers selling their soft wheat for shipment, then using the money to buy hard wheat flour shipped in. In nearly every town where there was a mill, some local dealer usually gave it competition by selling an imported flour. The result has been the shutting down of many mills. It is now urged that these plants be put to work again, that farmers get their own grain products ground for their own use, and transportation waste be saved. It is suggested that most of these plants, whch are steam driven, could use wood as fuel, procurable in their vicinities. The recrudescence of these power plants will create a demand for equipment of an electrical nature, and a large demand ultimatelv for such equipment, since it is figured that any feasible energy source will surely prove profitable because needed in the next few years.

# New Electrical Appliances

***A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances***

### New Industrial and Depot Electric Trucks.

An advanced type of electric storage-battery truck is shown in the accompanying illustration of a cradle dump body mounted on a type B electromobile manufactured by the Orenstein-Arthur Koppel Company, of Koppel, Pa.

The truck proper is of standard electromobile construction with steel channel frame and metal-protected oak platform hinged in two parts. Wheels are of cast steel, 20 inches in diameter with Goodrich solid-rubber tires and two Timken bearings to each wheel. A Wagner motor with foolproof Wagner control is provided. Power is furnished by a 24-cell seven-plate Ironclad-Exide battery. The entire frame is supported by four spiral steel springs, thus protecting both load and truck from shock. The wheel base is 52 inches with a 34-inch gauge. The truck has a capacity of 3,000 pounds and attains a speed of 7 miles per hour. The body is of the self-clearing type with a dumping angle of 40 degrees and dumping is accomplished from the platform by a simple and troubleproof mechanism. To gain access to the motor jackshaft and brake it is only necessary to loosen a few bolts to lift off the dump-body frame and then open the hinged platform. This truck can be used as a tractor and will pull 10,000 pounds.

To reduce the time required in handling baggage, mail and express matter of the Union Terminal, Dallas, Texas, a new type of electric truck has been developed by the Orenstein-Arthur Koppel Company. In the Union Terminal the distant ends of the station platforms are approximately 750 feet from the baggage and express rooms in the station proper. Using the old-style station trucks, this haul would require

Dumping Type of Industrial Storage-Battery Truck.

one man at least to each truck and an average time of 10 minutes.

One of the new electric tractors hauling a number of trucks makes the distance in three minutes. Three of these tractors now take care of the entire work. Each tractor will push or pull 20,000 pounds at a time at a maximum speed of 7 miles per hour. A 24-cell,

Electric Baggage Tractor With Double-End Control.

15-plate Ironclad-Exide battery of 220-ampere-hour capacity is employed on account of the unusually heavy duty the tractors are called upon to perform. The cells are divided between the two battery boxes carried on the truck platform, the larger box containing three trays of six cells each, the remaining six cells being housed in the smaller front box. The covers of the boxes serve as seats for the operator.

Control is by means of the handles shown and two foot pedals which are so located that the tractor can be operated in narrow aisles without turning, the operator merely changing seats.

In all other respects the tractor is of the standard electromobile construction, which is the base of several types of trucks and tractors being developed by the company.

In addition to handling the baggage, mail and express much faster, the tractors are saving the wages of 12 men who would have been necessary in operating the old-style station trucks.

---

### Split-Lever Starting Switch Throws With Reduced Effort.

The General Electric Company, Schenectady, N. Y., has developed an ingenious arrangement to reduce the effort necessary to operate large lever switches used for starting large synchronous converters from the alternating-current side in conjunction with the auto-transformers.

This is made clear from the illustration herewith, which shows two triple-pole lever switches for starting

a six-phase converter. The switch on the left really consists of two switches, side by side, which act as a single switch when closed in the lower position. There are two crossbars with separate handles, one half of the blade of each pole being fastened to one of the crossbars, while the other half is attached to the other crossbar.

When used to start a synchronous converter the upper contacts are connected to the two-thirds voltage tap for but a short time and the contacts are constructed to make contact with the portion of the blades first thrown downward or to the running side.

**Triple-Pole Double-Throw Converter-Starting Switches. One at Left Is of Split-Lever Type, Rated at 4,000 Amperes. Right-Hand Switch Is for 1,500 Amperes.**

This portion of the entire switch, comprising half the blade area, carries the current until the remaining half of the switch can be thrown to the lower position.

Switches of this type have been built up to 5000 amperes capacity. They are easily operated and avoid the alternative, which is the installation of large solenoid-operated circuit-breakers at considerably more expense.

## Electric Welding for Pressure Containers.

Charles Hollup, Milwaukee, Wis., recently read a paper before the American Society of Refrigerating Engineers, in which he discussed electric resistance welding, and electric arc welding in an interesting manner. He takes up these subjects with especial reference to the construction of welded pressure containers. These two kinds of electric welding are described with reference to the adaptability of each one to different kinds of work. He discusses electric arc welding in comparison with oxy-acetylene welding. Details of the application of welding to actual work are given clearly.

## Bussman Inclosed Fuses for Automobiles.

Almost every automobile nowadays is equipped with not only electric ignition, but also electric lighting and starting systems, all of which must be protected by appropriate fuses. Such fuses should be of approved type and preferably of the inclosed form. The large number of cars now on the market calls for a considerable assortment of automobile fuses, which may prove confusing to the automobile supply or garage man.

The Bussman Manufacturing Company, 3819 North Twenty-third Street, St. Louis, Mo., has been manufacturing automobile fuses for some time and has available a complete assortment of fuses for this purpose. These are made both with glass tubes and fiber tubes and conform strictly with the specifications of the Society of Automobile Engineers. Glass-tube fuses can be used up to 50 volts and fiber fuses for all higher voltages. All these fuses are furnished ten in each carton and ten cartons in a box. They are made in various ampere capacities up to thirty amperes. In the accompanying table is given a complete list of practically all popular cars, showing the proper fuse to be used. This table has been found very valuable by all dealers and garage men, enabling them quickly to determine which type of fuse should be supplied.

| Make | Fuse | Amp. |
|---|---|---|
| Allen | 5A | 15 |
| Amesberry | 6A | 20 |
| Anderson | 5A | 5-15 |
| Apperson | 3A | 10 |
| Arbenz | 4A | 10 |
| Auburn '15 | 5A | 15 |
| Auburn '17 | Link | |
| Austin | 5A | 5-15 |
| Biddle | 5A | 10 |
| Bour-Davis | 2A | 20 |
| Briscoe '15 | 3A | 15-20 |
| Briscoe '16, '17 | 1A | 20 |
| Buick | Link | |
| Cadillac '13 | 4A | 15 |
| Cadillac '14 | 6A | 25 |
| Cartercar | Plug | 15 |
| Cartercar 9 | 4A | 15 |
| Cartercar '15 | 5A | 10 |
| Case | 5A | 5-15 |
| Case '17 | 1A | 20 |
| Chadwick | 4A | 5 |
| Chadwick | 5A | 15 |
| Chalmers '14 | 6A | 15 |
| Chalmers 26B, 35, 648, 654 | 6A | 20 |
| Chalmers 32, 640, 92 | 1A | 20 |
| Chalmers 35 | 2A | 15 |
| Chalmers 36 | 5A | 20 |
| Chandler | 5A | 5-15 |
| Chandler '16 | 1A | 20 |
| Chandler '17 | 3A | 20 |
| Chevrolet 490 | 1A | 20 |
| Chevrolet '15, '16 | 6A | 20 |
| Chevrolet '17 | 1A | 20 |
| Cole | 4A | 15 |
| Crawford | 5A | 5-15 |
| Crow | 1A | 20 |
| Cunningham James '14 | 4A | 15 |
| Cunningham James '15 | 1A | 20 |
| Cunningham, James '16, '17 | 5A | 20 |
| Daniels | 5A | 5-15 |
| Davis | 1A | 20 |
| Davis | 5A | 5-15 |
| Detroiter | 5A | 15 |
| Detroiter '17 | 1A | 20 |
| Dispatch | 4A | 10 |
| Dispatch '17 | 3A | 15 |
| Dixie | 2A | 10 |
| Dixie '17 | 3A | 10 |
| Dodge | 4A | 10 |
| Dorris | 5A | 15 |
| Dort | 2A | 5-15-25 |
| Dort '16, '17 | 1A | 20 |
| Drexel | 3A | 20 |
| Elcar | 2A | 15 |
| Empire '14 | 3A | 5-15 |
| Empire '15, '16, '17 | 6A | 20 |
| Empire '16, '17 | 1A | 20 |
| Enger | 1A | 20 |
| Farmack | 3A | 15 |
| Fiat | 5A | 5-15 |
| Fiat '16, '17 | 6A | 30 |
| Franklin | 3A | 15 |
| Franklin '17 | 2A | 10 |
| Glide | 5A | 5-15 |
| Grant Six | 5A | Special |
| Grant '17 | 3A | 20 |
| Haynes | 1A | 15 |
| Haynes '17 | 1A | 5 |
| Hal | 6A | 15 |
| Hollier Eight | Link | |
| Hudson | 4A | 15 |
| Hupmobile '14 | 5A | 5-15 |
| Hupmobile '15, '16 | 4A | 15 |
| Hupmobile '17 | 4A | 10 |
| Imperial 56 | 4A | 5 |
| Imperial 64 | 1A | 20 |
| Imperial 66, 66F | 5A | 15 |
| Interstate | Link | |
| Jackson '16, '17 | 1A | 20 |
| Jeffery '13, '14 | 5A | 15 |
| Jeffery '15 | 4A | 10 |
| Jeffery '16, '17 | 3A | 20 |
| Jordan | 3A | 20 |
| King | 3A | 10 |
| King | 5A | 30 |
| Kissel-Kar '15 | 5A | 15 |
| Kissel-Kar '16, '17 | 3A | 20 |
| Knox | 4A | 10-15 |
| Lexington Four | 6A | 15 |
| Lexington Four | 5A | 5-15 |
| Lexington Six | 5A | 5-15 |
| Lexington Super Six '17 | 3A | 15 |
| Locomobile '14 | 6A | 30 |
| Locomobile '15 | 5A | 15 |
| Locomobile '16, '17 | 5A | 10 |
| Lozier | 6A | 10 |
| Lozier Four '17 | 6A | 20 |
| Lyons-Knight '13 '14 | 4A | 10 |
| L. C. H. | 4A | 15 |
| Madison | 2A | 5-15 |
| Marion | 5A | 5-15 |
| Marmon | 4A | 15 |
| Marmon '17 | 4A | 5 |
| Marmon '17 | 4A | 20 |
| Master | 5A | 15 |
| Maxwell '14 | 4A | 15 |
| Maxwell '15, '16, '17 | 3A | 20 |
| McFarlane '76 | 5A | 5-15 |
| McFarlane '17 | 5A | 10-30 |
| Mercer '16, '17 | 5A | 30 |
| Mercer '16, '17 | 3A | 5-10 |
| Metz | 1A | 20 |
| Mitchell '13, '14 | 4A | 15 |
| Mitchell '15 | 3A | 15 |
| Mitchell '16 | Link | |
| Mitchell '17 | 3A | 20 |
| Moline '14 | 4A | 10 |
| Moline '15 | 5A | 15 |
| Moline '16, '17 | 6A | 20 |
| Monroe | 6A | 20 |
| Monroe '16, '17 | 1A | 20 |
| National '14 | 4A | 15 |
| National '16 | 1A | 20 |
| Norwalk Six | 5A | 15 |
| Oakland | 4A | 15 |
| Overland | 1A | 20 |
| Overland '14 Coupe | 6A | 20 |
| Owen Magnetic | 5A | 10 |
| Packard | 2A | 10 |
| Packard Trucks | 2A | 20 |
| Paige | 1A | 20 |
| Pathfinder | 5A | 5-15 |
| Peerless '14 | 3A | 20 |
| Peerless '15 | 1A | 20 |
| Peerless '16, '17 | 6A | 20 |
| Peerless '17 | 1A | 10 |
| Pierce-Arrow | 5A | 5-10-30 |
| Pope-Hartford | 4A | 10 |
| Pratt | 1A | 20 |
| Premier '15 | 3A | 10 |
| Premier '16 | 4A | 10 |
| Pullman | Link | |
| Pullman '17 | 1A | 20 |
| Regal '14, '15 | 5A | 5 |
| Reo '14, '15 | 4A | 10-15 |
| Reo '16, '17 | 2A | 5-10 |
| Roamer | 3A | 10 |
| Rosa Eight | Plug | 20 |
| Saxon Six | 1A | 20 |
| Saxon Six | 5A | 15 |
| Simplex '15, '16, '17 | 5A | 15 |
| Simplex '15, '16 | 6A | 30 |
| Simplex '17 | 6A | 20 |
| Spaulding | 5A | 5 |
| Speedwell | 4A | 15 |
| Stageman Trucks | 5A | 15 |
| Standard '16 | 6A | 10 |
| Standard '17 | 6A | 5-15 |
| Stayer | 4A | 15 |
| Stearns Four | 1A | 20 |
| Stearns Eight | 3A | 20 |
| Stephens '17 | 1A | 20 |
| Studebaker '14 | 4A | 15 |
| Studebaker '15 | 2A | 15 |
| Studebaker '16, '17 | 3A | 10 |
| Stutz | 3A | 15 |
| Sun '17 | 2A | 20 |
| Velie '15 | 1A | 20 |
| Velie '16, '17 | Link | |
| Westcott | 4A | 15 |
| White '15 | 5A | 15 |
| White '16 | Link | |
| Willys-Knight | 2A | 15 |
| Willys-Knight | 4A | 15 |
| Willys-Knight | 5A | 15 |
| Willys-Knight | 6A | 20 |
| Winton | 3A | 10 |
| Winton 21A | 5A | 5-20 |
| Winton '16, '17 | 3A | 15 |
| Zimmerman | 3A | 15 |
| **ELECTRIC CARS** | | |
| American | 5A | 10 |
| Anderson '14, '15, '16 | 6A | 10 |
| Anderson '15 | 5A | 5-15 |
| Argo ABC | 5A | 10 |
| Bailey | 6A | 10 |
| Baker | 5A | 10 |
| Borland | 5A | 10 |
| Broc | 5A | 10 |
| Century | 6A | 10 |
| Chicago | 6A | 15 |
| Dayton | 6A | 10 |
| Detroit '14 | 6A | 10 |
| Detroit '15 | 5A | 15 |
| G. V. C. | 6A | 5 |
| Grinnell | 6A | 15 |
| Hupp Yeates | 6A | 5 |
| Ohio | 6A | 15 |
| Standard | 6A | 15 |
| Ward | 3A | 5 |
| Waverly | 4A | 5 |
| Woods | 5A | 5 |
| Woods '17 | 3A | 10 |
| **STARTING AND LIGHTING SYSTEMS.** | | |
| Apperson | 3A | 10 |
| Applecoe | Link | |
| Bijou | 3A | 10 |
| Briggs & Stratton | 3A | 20 |
| Dean | 3A | 15 |
| Electric Auto Lite | 1A | 20 |
| Esterline | 4A | 15 |
| Gray & Davis | 1A | 20 |
| Gray & Davis Ford '15 | 5A | 30 |
| Gray & Davis Ford '16 | 3A | 20 |
| North East | 4A | 10 |
| Remy | 2A | 5-15 |
| Splitdorf | Link | |
| Westinghouse | 4A | 15 |
| Westinghouse Special | 5A | 20 |
| Westinghouse Ford | 3A | 15 |
| **MOTORCYCLES.** | | |
| Harley-Davidson | 2A | 5 |
| Excelsior '14, '15 | 3A | 15 |
| Excelsior '16, '17 | Link | |
| Indian | 4A | 15 |

**Complete List of Automobiles, Showing Proper Fuse to Use.**

# Activities in the Trade

**Bridgeport Brass Company,** Bridgeport, Conn., announces the removal of its New York office to Suite 2236, Woolworth Building, 233 Broadway where more commodious quarters have been provided.

**American Insulation Company,** Philadelphia, Pa., has filed plans for the construction of its proposed new plant at Roberts Avenue and Stokley Street. The structure will be 83 by 130 feet, and cost about $45,000.

**General Electric Company,** Harrison, N. J., has taken bids for the construction of a one and two-story, reinforced concrete and brick addition, 135 by 255 feet, to its Edison Lamp Works. The estimated cost is $200,000.

**Leeds & Northrup Company,** 4901 Stenton Avenue, Philadelphia, has issued a price list under date of July 15, announcing an increase of prices on laboratory instruments and apparatus necessitated by higher costs of materials.

**Standard Electric Stove Company,** 1718-20 North Twelfth Street, Toledo, O., has issued an especially appropriate patriotic calendar card for July. This shows the famous Liberty Bell and the flags of the United States entwined with those of Great Britain and France. The company is continuing its policy of aiding local dealers in general publicity work to promote the sales of electric ranges, fireless cookers, and other appliances which it manufactures.

**Allis-Chalmers Manufacturing Company,** Milwaukee, Wis., recently closed a contract with the city of Seattle for two 4700-kilowatt transformers. One is for 15,000 volts, and the other 2500 volts. They will be used in connection with the 10,000-kilovolt-ampere steam-turbine unit recently purchased from the Allis-Chalmers company, for the steam auxiliary station. The cost of the transformers recently purchased was $13,440. The order was placed through the company's Seattle office.

**Research and Industrial Development.**—Arthur D. Little, of Arthur D. Little, Incorporated, chemists and engineers, Boston, Mass., presents a professional paper on the "Relations of Research to Industrial Development," which was embodied in an address before the Canadian Manufacturers' Association, Toronto. In this address Mr. Little emphasized the importance of research work to all industries. He referred to the highly developed stages reached in various industries as the results of continual research.

**Beardslee Chandelier Manufacturing Company,** 216 South Jefferson Street, Chicago, is sending out illustrated folders pertaining to its "Denzar" semi-indirect lighting units, of varying sizes for all requirements. These include the pendent type, ceiling type and others. They enable one to use to the best advantage every possible ray of light, and are so constructed as to eliminate all glare and shadows, and give the greatest amount of diffused light at the right intensity. The folders are accompanied by price lists.

**Benjamin Electric Manufacturing Company,** 120-8 South Sangamon Street, Chicago, recently won a victory in some patent litigation conducted before Judge Hand of the District Court for the Southern District of New York. This litigation involved patent No. 1,012,970, on swiveling attachment plug, granted to Reuben Benjamin on December 26, 1911. The court held a swivel attachment plug manufactured by the Best Electric Company to be an infringement of this patent, five claims being declared to be particularly infringed.

**Betts & Betts Corporation,** 511-3 West 42nd Street, New York City, has recently secured a contract for furnishing a large double-face B. & B. "elektrik klok" and electric sign for the Narragansett Electric Light Company, Providence, R. I. The sign will be 70 feet high and the clock will be at the bottom thereof. This clock will have an 80-beat, self-winding master clock controlling a standard secondary motor-operated mechanism. Outfits of this kind are guaranteed by the company to keep time as accurately as within one minute during a month.

**Geyser Electric Company** is the new name of the company formerly known as the Capital Electric Company, which has for several years been manufacturing the Geyser electric washers. These machines employ an electric pump forcing a sort of geyser spray through the clothes being washed. The company's location remains as formerly, at 321-3 North Sheldon Street, Chicago.

**Western Electric Company,** in pursuance of its policy of "Service First," announces the opening of three new electrical supply warehouses. In order better to serve the trade in Connecticut and adjacent territory, an office and warehouse have been established in New Haven, at 135 Wood Street, with Tyler L. Holmes in charge. The Baltimore branch, opened July 16, is situated at 425 Olive Street, where S. Greenfield, formerly of the Philadelphia house, heads the sales force. A complete stock of electrical supplies has been put in at that branch. At Charlotte, N. C., a warehouse and sales office have been opened at 238 West First Street, with R. H. Bouligny in charge. In order to handle the growing demands of business in the Northwest, the Seattle warehouse and sales office have been moved to commodious quarters at 84 Marion Street.

**Henry L. Doherty & Company's** bond department has opened a branch office in Toledo, O., which is the third step in a comprehensive plan for selling securities to consumers of Doherty service. Walter J. Young, formerly power salesman of the new-business department of Toledo Railway & Light Company, is in charge of the Toledo branch. The plan was inaugurated at Massillon, O., in 1914, by the sale of the preferred stock of the Massillon Electric & Gas Company to the public. Last February a more elaborate campaign was carried on in Denver, including the organization of the firm of Barker & Smith to deal in the Doherty securities. The bond department hopes, in time, to have either a special representative in every Doherty community, or an organized security selling campaign under the direction of the general manager of the Doherty local company.

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., reports the recent sale of motors for mine hoists, aggregating 1350 horsepower. Largest of these is a 700-horsepower motor for a 300-foot coal hoist at the Inland Steel Company's mines at Harmarville, Pa. This hoist will make three trips per minute. On the same property a 200-horsepower motor will drive a man hoist, making two 300-foot trips per minute. Other sales items are as follows: Diamond Coal & Coke Company, Sharpsburg, Pa., one 350-horsepower motor; Republic Iron & Steel Company, Youngstown, O., one 300-horsepower motor; E. & G. Brooks Iron Company, Birdsboro, Pa., one 200-horsepower motor; Mt. Pleasant Coal & Coke Company, Greensburg, Pa., one 200-horsepower motor; Valley Smokeless Coal Company, Pittsburgh, Pa., one 200-horsepower motor; Eclipse Gas Coal Company, Pittsburgh, Pa., one 150-horsepower motor. All of these motors are Westinghouse type CW wound-rotor induction motors, with type F magnetic control.

**The Snyder Electric Furnace Company,** Monadnock Block, Chicago, has passed to the control of the Industrial Electric Furnace Company. The transaction comprises the transfer of the business of the former company, together with all the Snyder patents and designs of electric furnaces and processes to the new concern. The company has a plant at Clearing, near Chicago, which is to be enlarged for a greater amount of steel work, and for electrometallurgical development. Charles B. Sommers, Stoughton A. Fletcher and Charles B. Fletcher, of Indianapolis, and F. Von Schlegell and F. T. Snyder, of Chicago, constitute the board of directors. Mr. Snyder will be further identified with the company as engineer and metallurgist. To his research and invention is due the development of the Snyder furnace in the steel industry, both economically and in a scientific sense. The company will engage in the production of electric furnace products at its plant. F. Von Schlegell and Charles B. Fletcher are the executive officers of the company, with offices at 1405 Monadnock Block, Chicago.

# Personal and Biographical

ARTHUR M. TORREY has recently resigned his position with W. S. Barstow & Company, 50 Pine Street, New York City, to become associated with Hildreth & Company, 15 Broad Street, New York, inspection engineers.

E. C. SEARLE, general representative of Allis-Chalmers Manufacturing Company, Milwaukee, is on the Pacific Coast, giving special attention to the development of the shipbuilding industry. He has made a study of the situation in Seattle, and recently visited Portland with R. T. Stafford, northwest manager for that company. He will go to San Francisco and Los Angeles prior to his return east. He is impressed with the enormous development in shipbuilding since his visit of a year ago.

GEORGE H. HARRIES, for years prominent as a public utility executive, has received a leave of absence from the various corporations with which he is connected in order to resume military service. He is now in command of the Nebraska National Guard, at Fort Crook, having been commissioned Brigadier General by Governor Neville, as of June 25, and will be recommended by the War Department for similar rank in the regular army. General Harries, since 1912, has been a vice-president of H. M. Byllesby & Company. He is also president of the Louisville Gas & Electric Company, the Omaha Electric Light & Power Company, the Arkansas Valley Railway Light & Power Company, and an officer in a number of other large utility organizations. From 1900 to 1911 he was vice-president and general manager of the Washington (D. C.) Traction & Electric Company. During the past two years he spent much of his time in Omaha and became associated with many civic and patriotic activities in Nebraska. During the past several months General Harries has been engaged in work for the Council of National Defense and the War Department, having placed himself at the disposal of the Government when war was declared. The son of an officer in the British army, born in Wales in 1860, General Harries came to the United States when a boy and served as a scout under Generals Miles and Crook in frontier wars with the Indians. He was a member of the Government's commission settling the grievances of the Sioux Indians in 1891. In 1888 he went to Washington as a newspaper reporter, later becoming president of the Metropolitan Railroad Company in that city. From 1897 to 1917 he was brigadier general in command of the military and naval forces of the District of Columbia, retiring as major general May 26 of this year. During the Spanish-American war he served as colonel of the First District of Columbia Infantry, United States Volunteers, participating in the siege of Santiago, Cuba. He has been a member of the War Department Board on the Promotion of Rifle Practice since organization. He has been president of

George H. Harries.

the Association of Edison Illuminating Companies, president of the American Street Railway Association and an officer and member of the Public Policy Committee of the National Electric Light Association. He is a past National Commander of the Order of Indian Wars, composed of army officers.

H. H. CUDMORE, one of the best known men in the incandescent lamp business, has severed his connection with the National Lamp Works of General Electric Company and become the general manager of The Argus Lamp & Appliance Company, Cleveland, Ohio. Mr. Cudmore has for something like twenty years been closely associated with incandescent-lamp manufacture and sales. For many years he was manager of the Brilliant Lamp Division and more recently engaged in special development work for the National Lamp Works. The Argus company, of which he has become general manager, is the manufacturer and general distributor of the newly perfected Oscar Sherck universal project lamp appliances. These are the invention of Oscar Sherck, a well-known

H. H. Cudmore.

motion-picture projection expert, and provide for the substitution of the ordinary arc lamp in motion-picture work by special Mazda lamps. This is a development of far-reaching importance and will be described more at length in an early issue. Mr. Cudmore is being congratulated by his numerous friends on being actively connected with this work.

GEORGE W. ROBINSON, president of the Tri-State Telephone & Telegraph Company, St. Paul, Minn., was recently elected president of the United States Independent Telephone Association by the board of directors of that organization. He succeeds Charles Y. McVey, who resigned.

ROBERT E. RAE, several years with Western Electric Company, and during the last four years sales manager for Stanley & Patterson, New York, manufacturers of electric bells and other signaling apparatus, has resigned the latter position. Mr. Rae, while he has not definitely settled as to future plans, announces that he probably will continue in the selling line in connection with electrical equipment. He is a member of the Jovian Order, and has a wide acquaintance with the trade.

## Obituary.

JAMES WHITFIELD WOOD, Easton, Pa., president of the electric light and power company at Henderson, N. C., died on June 24, aged 72 years. He was a graduate of Lafayette College and a member of the firm of Tippet & Wood, Phillipsburg, N. J., manufacturer of boilers and tanks.

JOHN H. CAHILL, of New York City, prominent in the telephone industry, died at his residence in that city on July 5. Mr. Cahill was born in 1859, and at the age of twenty years became associated with the Bell interests. In the late eighties he was secretary and attorney for the Metropolitan Telephone & Telegraph Company, and from 1896 to 1914, vice-president, general counsel and director of the New York Telephone Company, as well as a director of numerous other telephone and allied organizations.

WILLIAM G. BEE, vice-president and former sales manager of the Edison Storage Battery Company, West Orange, N. J., died at his residence, 477 Main Street, Orange, on July 11, after an illness of many months, aged 48 years. Mr. Bee was prominent in the automobile industry in its early development, having driven the first electric automobile in Newport, R. I., with John Jacob Astor as a passenger. He was born at Hartford, Conn., and was at one time connected with the Pope Manufacturing Company, which later formed the Electric Vehicle Company. He left this interest to join the storage-battery works of Mr. Edison, while operating at Glen Ridge, N. J., later becoming vice-president and until his illness, acting as sales manager. He was a thirty-third degree Mason.

# Current Electrical News

## WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

### EASTERN STATES.

BROOKLYN, N. Y.—The Carson C. Peck Memorial Hospital will build a power house at the new hospital to be constructed at Troy and Albany Avenues. Ludlow & Peabody, 101 Park Avenue, New York, are architects. C. S. Meerbard, 350 Fulton Street, Brooklyn, is representative.

BUFFALO, N. Y.—The Buffalo General Electric Company, 39 Genessee Street, will hold a meeting of stockholders July 30 to approve a bond issue of $4,400,000.

NIAGARA FALLS, N. Y.—The Shawinigan Water & Power Company has closed a contract with a subsidiary of the Carborundum Company of Niagara Falls, N. Y., The Canadian Aloxite Company. This company has started the construction of a plant at Shawinigan Falls for the manufacture of carborundum and other abrasives.

ONEIDA, N. Y.—The Chamber of Commerce is arranging for investigation to secure data for a local municipal electric lighting plant.

OYSTER BAY, L. I., N. Y.—The New York Telephone Company has awarded a contract for the erection of a new two-story telephone exchange, about 40 by 60 feet, on Tooker Avenue. S. H. Booth & Son, 30 Centre Street, City Island, are contractors.

SHERMAN, N. Y.—The Borough officials have made application to the Public Service Commission for permission to install and operate a municipal electric lighting plant.

UTICA, N. Y.—A power plant will be constructed by the Savage Arms Corporation in connection with new machine shops and other extensions to its plant. Charles T. Myers, engineer.

WESTFIELD, N. Y.—The Board of Trustees is planning for the installation of new equipment at the municipal lighting plant, including engine and other apparatus.

ALLENHURST, N. J.—The Atlantic Coast Electric Company has commenced the erection of an addition to its local power station.

BAYONNE, N. J.—The Board of Education will receive bids up to July 26 for electrical work in the new addition to be constructed at school No. 11. D. G. Anderson, Avenue E and Thirtieth Street, is architect.

BORDENTOWN, N. J.—The Common Council is considering the installation of a new and improved fire alarm system.

CLIFFSIDE, N. J.—The Borough Council, Cliffside Park, is considering the installation of new ornamental standards on streets in the Edgewater Heights section. It is also planned to install new high-power lamps in the downtown section, replacing present incandescent lights.

NUTLEY, N. J.—The Town Commission is considering the installation of a new fire alarm signal system to operate at police headquarters.

POMPTON LAKES, N. J.—The Common Council has authorized a lease for a water power site on Pompton Lake and the installation of a power plant to replace the service now being furnished by the water and lighting plant.

TRENTON, N. J.—The Board of Freeholders is planning for a lighting system on the River Road, from the city line to Wilburtha.

TRENTON, N. J.—The Board of Public Utility Commissioners has granted permission to Robert Carson, receiver for the Hudson & Middlesex Telegraph & Telephone Company, to sell the company's property, effects and franchise to William MacHarg, Belmar, who is affiliated with the Bell system interests.

BANGOR, PA.—The S. Flory Manufacturing Company, manufacturer of engines, is said to be planning for the electric operation of its plant, with individual motor drive. The Pennsylvania Utilities Company will furnish the service.

HARRISBURG, PA.—The Harrisburg Light & Power Company has received a five-year lighting contract from the city, covering street-lighting and service for municipal buildings.

MILLERSBURG, PA.—The Millersburg Electric Company is making rapid progress in the construction of a new line to Halifax, to furnish light and power service. It is planned to commence the operation of the new system on September 1.

MOUNT CARMEL, PA.—The Edison Electric Illuminating Company has been acquired by new interests represented by George de B. Keim, Chandler & Company, Inc., Philadelphia. The company has a capital of $200,000 and furnishes service to Mount Carmel, Kulpmont, Marion Heights and neighboring sections, including about 20,000 incandescent lamps and 150 arc lights.

PHILADELPHIA, PA.—E. F. Houghton & Company, American and Somerset Streets, manufacturers of belting, have filed plans for a one-story addition to their power plant.

PHILADELPHIA, PA.—A one-story power plant for factory operation will be constructed by the H. Belfield Company, 435 North Broad Street, at its plant to be erected at Twentieth and Cambria Streets for the manufacture of plumbers' supplies.

PHILADELPHIA, PA.—Swift & Company, Noble Street, have taken bids for the erection of a one-story addition, 34 by 74 feet, to their engine and power house, Ninth and Noble Streets.

PHOENIXVILLE, PA.—The City Council is figuring on borrowing $45,000 to build a municipal electric light plant.

WILKES-BARRE, PA.—Upon application of the Wilkes-Barre Company, the Supreme Court has handed down an order preventing the Wilkes-Barre Light Company, a new organization, from exercising any rights as a competitive company until the controversy between the two companies is settled in the courts. This will prevent the new company from submitting a bid for lighting to the city, unless the period for receipt of bids is extended.

BALTIMORE, MD.—The Baltimore Drydocks & Shipbuilding Company will build a power plant for works operation at its new shipyards extension, to cost about $3,000,000. The transformers, rotary converters and switchboard will be furnished by the Westinghouse Electric & Manufacturing Company, and the necessary motors by the General Electric Company. Electric power at primary voltage will be supplied by the Consolidated Gas, Electric Light & Power Company.

WASHINGTON, D. C.—The Quartermaster-General's Department has awarded a contract for the installation of an electric lighting plant and distributing system at San Antonio, Tex., to Stone & Webster Construction Company, 120 Broadway, New York.

BLUEFIELD, W. VA.—The National Carbide Corporation, recently organized with a capital of $350,000, is negotiating with the Appalachian Power Company for electric service for its proposed new plant to be located at Ivanhoe, Va.

CHARLESTON, W. VA.—Mason Coal & Chemical Company, Union Building, recently incorporated with a capital of $5,000,000, will purchase electric equipment for its proposed new plant near Hartford, W. Va. Complete apparatus will be installed for factory operation, including engines, boilers and auxiliary equipment.

HARTLAND, W. VA.—The Hartland Power Company is planning for the extension of its transmission system to Dorfee, about 4 miles, for power supply to local coal properties. The line will carry 13,200 volts. W. S. Barstow & Company, 50 Pine Street, New York, operate this company.

ZEBULON, N. C.—The city has sold a bond issue of $6,000 for an electric lighting station.

JACKSONVILLE, FLA.—The City Council is planning purchasing additional machinery for the city electric lighting plant. Address Commissioner of Public Works.

### NORTH CENTRAL STATES.

ATHENS, O.—Directors of the Hocking-Sunday Creek Traction Company have authorized the purchase of additional equipment, rendered necessary by increased business, including a large new car with a heavy motor, intended to handle trailers loaded with coal.

ALBANY, O.—The City Council will call an election on the proposition to purchase the electric light plant from the Oregon Power Company. If purchased, the plant will be remodeled and enlarged.

BOWLING GREEN, O.—Ohio Northern Public Service Company is spending $80,000 on improvements to lighting and heating plants. A line is being extended to Portage for lighting service.

CANTON, O.—The city Service Director has informed the Council that rewiring of the auditorium according to requirements of the Ohio electrical wiring code is necessary, and that the work will cost about $8,000.

CANTON, O.—Plans are being considered by the County Commissioners for reconstructing the lighting system in the courthouse, at a cost of $3,000 to $4,000, on the report of wiring inspectors to the effect that the present system is not safe.

CINCINNATI, O.—The clerk of the Cincinnati Board of Education will receive bids until August 13 for installing electric lights in the new 20th District School. Plans and specifications are on file with the Board.

CINCINNATI, O.—Plans have been prepared by Howard McClorey, architect, for a group of buildings for the Sisters of Providence Convent, including a power plant with equipment to furnish light and power, and to take care of the laundry and bakery departments of the institution. Accommodations for 300 sisters and students will be provided.

CINCINNATI, O.—The Union Gas & Electric Company, in anticipation of an increased demand for electric service in the northern and northeastern part of the city, is arranging to construct a sub-station adequate to serve those districts. It has leased a building in Evanston large enough to serve as a sub-station, while a contract has been let for a new building in Elmwood to serve as a sub-station.

CLEVELAND, O.—The Cleveland Electric Illumination Company has had plans prepared for an electric power station to cost $100,000.

ELYRIA, O.—Lorain County Electric Company was granted a 25-year franchise, the maximum rate being fixed at 10 cents per kilowatt, the average being 6 cents.

HAMILTON, O.—The Ohio Gas & Electric Company, Cincinnati, has purchased a site east of Hamilton on which to erect a large sub-station.

LORAIN, O.—It is probable that Lake Shore Electric Company will build a line that will afford car service to the Cromwell steel plant.

SANDUSKY, O.—The Sandusky Home Telephone Company has purchased a site and will erect a new exchange on Washington Row.

GOSHEN, IND.—The Hawks Electric Company of Goshen has acquired the

plant of the Syracuse Light & Power Company of Syracuse, Ind.

CHICAGO, ILL.—With only one dissenting vote, members of the Sanitary Board have decided on electrical power for use on the proposed Calumet pumping station. Trustee W. G. Clark, chairman of the committee, favored the use of steam power for the pumping station. The Board also empowered a committee to negotiate with Frank I. Bennett, Commissioner of Public Works, for the purchase of a number of turbines and generators from the city and for the taking over of the street lighting.

CHICAGO, ILL.—The Louisville Gas & Electric Company, a subsidiary of Standard Gas & Electric Company, has secured a contract with the Government to supply 1,000 kilowatts of electric power for new army cantonment being erected south of Louisville. The lighting load approximates 17,000 40-watt lamps for building. Power load for pumping will be 100 kilowatts.

CHICAGO, ILL.—The Chicago Telephone Company has purchased a site on Larrabee Street, on which to erect a telephone exchange.

GREENVIEW, ILL.—The Menard Telephone Company has increased its capital stock from $1,000 to $25,000 and will make improvements.

LINCOLN, ILL.—The Lincoln Water & Light Company offers to lease and operate the municipal street railway, after the tracks and overhead wires have been rehabilitated by the city with funds from a $30,000 bond issue already voted. Company also asks city to provide adequate rolling stock. The company offers to maintain equipment after operations begin under the proposed lease, and will fix up city plant to supply current for operating cars.

GLADSTONE, MICH.—A plant for the manufacture of motors and dynamos will be erected here by a company recently organized which will be a subsidiary of the Marble Arms & Mfg. Company. John F. Card of Three Rivers, Mich., is one of the owners.

RED JACKET, MICH.—Houghton County Electric Light Company leases the town's conduit system for its electric wires. These conduits have been so wrecked by sinking ground that they will have to be rebuilt at a cost of $20,000; otherwise the company will erect pole lines.

SHEBOYGAN, WIS.—The Fargo Engineering Company, Consumers building, Jackson, Mich., has prepared plans for a power house for the Eastern Wisconsin Electrical Railway, Grand Rapids Saving Bank building, Grand Rapids.

WATERFORD, WIS.—Wind River Telephone Company has decided to establish exchange connections with Thompsonville and Union Grove.

PIPESTONE, MINN.—Three groups of electric properties recently acquired by the Northern States Power Company, of Minnesota, are at present being operated as separate divisions until the electric transmission lines to tie them in with the comprehensive network of the company throughout the state are completed. The following are the names and addresses of the companies taken over: Northwestern Light & Power Company, Pipestone; Northwestern Light & Power Company, Hutchinson, Minn.; Minnesota Valley Light & Power Company, Montevideo, Minn.

BATAVIA, IA.—The Ottumwa Railway & Light Company, Ottumwa, is improving its plant and will build a transmission line. Address C. E. Fahrney, manager, at Ottumwa.

COLLINS, IA.—Franchise has been granted to C. E. Lookingbill for the erection of an electric light plant. Address the manager.

DES MOINES, IA.—The Iowa Telephone Company, 1006 Grand Avenue, will install a telephone system at Camp Dodge. Address manager.

PLYMOUTH, IA.—The Iowa Heat, Light & Power Company, Grinnell, has purchased a site and will build a power plant.

SAC CITY, IA.—The voters will pass on the question of issuing bonds to the amount of $60,000 for a municipal lighting plant, on August 3.

SIOUX CITY, IA.—Plans are being made for an addition to the power station of the Sioux City Gas & Electric Company. Estimated cost, $200,000.

COLUMBIA, MO.—The McKinley company is planning, it is said, the building of transmission lines to supply several towns in the northeastern part of the state, as far south and west as Columbia and perhaps Jefferson City.

AGRA, KANS.—City ordinance providing for electric current from the Phillipsburg Mill & Elevator Company for a period of ten years was passed.

HADDAM, KANS.—The Concordia Light & Power Company is planning the building of a transmission line through Haddam, Agenda, Cuba, Morrowville and Washington. The towns are to vote the bonds to build the line, said bonds to be retired by the company in ten years, paying all interest, cost of election and selling bonds. Definite action will be taken on this immediately.

LENORA, KANS.—Election to vote bonds for the purpose of erecting and equipping an electric light plant resulted in approval of the bond issue.

BOWMAN, N. D.—The Western Electric Light & Power Company, operating light plants at Marmarth and Bowman, has sold its interest to the Dakota Utilities Company, which has a line of plants in South Dakota.

KENSAL, N. D.—Organization of the Kensal Electric Light & Power Company has been completed, according to an announcement made by President Feckler of the Commercial Club, and a $6,000 plant will be installed to light 70 buildings in the city. Officers of the company are: H. P. Krag, president; Anton Feckler, secretary, and F. L. Nichols, treasurer. Mr. Krag, who owns half of the capital stock, will be manager.

RUGBY, N. D.—Northern States Power Company has taken over for operation the electric utility at Rugby. This community will be served electrically by the Minot division. The Faribault division of the company has completed a transmission line to Byron and service will be turned on shortly.

## SOUTH CENTRAL STATES.

HAZARD, KY.—The Kentucky River Power Company has increased its capital from $100,000 to $350,000 for extensions.

JACKSON, KY.—Lewis Hays, Jr., Ryland C. Musick and M. G. Center have purchased the electric light and power plant of the Day Lumber & Coal Company and will continue the service.

FT. SMITH, ARK.—Fort Smith Light & Traction Company is constructing a transmission line to Alma, Crawford County, to connect with the lines of Citizens' Power Company. Alma, Mulberry and Ozark will be served by current from this system.

PIGGOTT, ARK.—The Missouri & Southeastern Utilities Company is building a line from Piggott to Paragould in order to serve certain towns from the central plant at Paragould. The central plant will be in operation about August 15.

LAWTON, OKLA.—A franchise was granted to the Southwest Electric Company recently.

BEAUMONT, TEX.—The taxpayers of Beaumont and Port Arthur have, by referendum vote, approved the proposed consolidation of the holdings of the Beaumont Electric Light & Power Company, the Beaumont Traction Company, the Jefferson County Traction Company and the Port Arthur Light & Power Company, all of which are subsidiaries of the Stone & Webster Engineering Corporation. The consolidated interests will install additional machinery in the electric light and power plants and make other important improvements.

SAN ANTONIO, TEX.—The City Commission passed an ordinance permitting the consolidation of the San Antonio Traction Company and the San Antonio Gas & Electric Company into a new corporation called the San Antonio Public Service Company, which has been incorporated with a capital stock of $4,700,000. The new company will begin the extension of its electric railway system to Camp Kelly, a distance of two and one-half miles. It has other extensions in contemplation and is authorized under its new charter to build interurban lines. It is reported that it will take over franchises of the San Antonio & Austin Tracton Company and carry out the project of constructing an interurban electric railway between this city and Austin, a distance of 85 miles. Involved in this project is the erection of a large electric power plant. The new company is controlled by Emerson McDillon, of New York, and associates.

SAN BENITO, TEX.—John L. Lomax has purchased the local water and light plant and telephone system. He will install additional machinery and equipment in the water and light plants and make other improvements to the service.

## WESTERN STATES.

LIBBY, MONT.—It is reported, but not officially, that the Great Northern Railway is to begin the electrification of the road from the main range of the Rocky Mountains westerly. It is also reported that the company contemplates the erection of a hydroelectric plant at Kootenai Falls to generate the power required.

SOCORRO, N. M.—The Mountain State Telephone Company is planning to run new lines to Albuquerque, thus giving Socorro two circuits.

MESA, ARIZ.—Arrangements have been completed for the erection of a new exchange building for the Mesa Telephone Exchange.

RENO, NEV.—The Truckee River General Electric Company is to build a high-tension power line from Verdi to the Poeville mining district.

COLVILLE, WASH. — The Stephens Light & Power Company has petitioned the County Commissioners of Stevens County for a franchise to operate in this county.

ELLENSBURG, WASH.—Heath & Gove, architects of Tacoma, are receiving bids for the construction of a new power house at the State Normal School.

LACONNER, WASH.—Stone & Webster, having large power and traction interests in the Puget Sound country, have been invited to extend its light service to this city, due to the fact that S. J. Everax, owner of the local plant, has closed same.

NORTH YAKIMA, WASH.—The Yakima Valley Transportation Company will extend its lines 2½ miles on the Selah-Taylor route during this summer.

PORT ANGELES, WASH.—An election will be held to vote on issuing bonds in the sum of $30,000 to pay outstanding debts against the lighting fund and to allow for improvements to the lighting system.

SEATTLE, WASH.—The date for opening bids for construction of the municipal hydroelectric power plant, with transmission lines, will be opened August 3 instead of July 20, as heretofore announced.

SEATTLE, WASH.—A. A. Phinney, D. P. Eastman and R. V. Ankeny, owners of a tract of land on Magnolia Bluff, have asked for a franchise to construct and maintain a street railway line.

TACOMA, WASH.—This city has passed an ordinance for extension of the municipal street car line from the limits of the city to the Todd Shipyards on the tide flats. The ordinance also provides for the issuance of $180,000 in utility bonds.

HAINES, ORE.—The overflowing of Rock creek caused a damage of $3,000

## DATES AHEAD.

Association of Iron and Electrical Engineers. Eleventh annual convention, Philadelphia, Pa., Bellevue-Stratford Hotel, September 10 to 14. Secretary, J. F. Kelly, National Tube Company, McKeesport, Pa.

Association of Railway Telegraph Superintendents. Annual convention, Hotel Raleigh, Washington, D. C., September 10 to 13. Secretary, W. L. Connelly, Gibson, Ind.

International Association of Municipal Electricians. Annual convention, Niagara Falls, N. Y., September 11 to 14. Secretary, Clarence R. George, Houston, Texas.

Northwest Section, National Electric Light Association. Annual convention, Spokane, Wash., September 12 to 15. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

American Electrochemical Society. Annual convention, Pittsburgh, Pa., October 3 to 6. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Electrical Contractors' Association of the United States. Annual convention, New Orleans, La., October 10 to 13. Secretary, H. C. Brown, Utica, N. Y.

to the Eastern Oregon Light & Power Company's flume and transmission line.

PORTLAND, ORE.—Bids are being received by the Western Reduction Company, a new industry, for a transformer and power house building in this city.

CORCORAN, CAL.—The San Joaquin Light & Power Corporation is installing a system of 29 1,000-candle power street lights in this city.

DALY CITY, CAL.—The County Clerk is receiving sealed bids for the illumination of the public highways in the Visitacion Lighting District.

GLENDALE, CAL.—The Board of Trustees is receiving bids for three-phase electric current to the city for operation of its electrical distributing system.

GRASS VALLEY, CAL.—A small electric plant will be installed to furnish power for air-compressor in driving a tunnel on the Shamrock group of mining claims, belonging to John Mansfield.

LEMOORE, CAL.—When the Board of Trustees opened bids for electrolier system, and other improvements, it was found that the bids exceeded the estimated amount by $10,000. The bids were rejected and the city will readvertise.

LODI, CAL.—Electroliers will be placed on East Lodi Avenue. Committees have secured funds for the installation of the lights.

LOS ANGELES, CAL.—The Pacific Electric Company will extend its tracks to take care of any traffic due to the military camp being located here.

OAKLAND, CAL.—The principal place of business of the Calistoga Electric Company is to be changed from Calistoga to Oakland, effective July 23.

OROVILLE, CAL.—The Great Western Power Company is soon to begin construction of a hydroelectric plant, estimated to cost $6,000,000.

PALO ALTO, CAL.—The United States is to build a cantonment here for which it will need 2,000,000 feet of insulated wire, 16,000 feet of lamp cord, 8,000 key sockets, 9,000 shades, 10,000 cleat receptacles, 8,500 snap switches and other electrical equipment.

SANGER, CAL.—A complete lighting system will be installed in Ward Oak Park.

SANTA ANA, CAL.—The Pacific Electric Railway Company has petitioned the Board of Supervisors for a five-year franchise to operate a line from Santa Ana to Tustin with a spur line to the Burgess packing house.

SAN FRANCISCO, CAL.—The California Railroad Commission has issued an order extending the time which the Northern Electric Railway Company shall construct an underground crossing near Cement, Solano county.

SAN FRANCISCO, CAL.—The California-Oregon Power Company has filed an application with the California Railroad Commission for authority to sell its hydroelectric properties in Trinity county to the Estabrook Gold Dredging Company.

SAN FRANCISCO, CAL.—The California-Oregon Power Company has filed with the California Railroad Commission an application for authority to charge Edward Stallcup & Sons Company, of Mauten, Siskiyou County, $27.50 a horsepower electric energy for six months' irrigation season.

SUNNYSIDE, CAL.—The Sunnyside Telephone Company and the Valley Telephone Company have combined and will be known as the City Telephone Company.

VENTURA, CAL.—The Ventura Light & Power Company is constructing a distributing system at Somis, which will cost about $4,000.

## PROPOSALS

HYDROELECTRIC POWER PLANT.—Board of Public Works, Seattle, Wash., which issued specifications for a hydroelectric plant of 25,000 kilowatts capacity, and asked for bids on same until July 20, has extended the date to August 3. Bidders are asked to submit plans and unit prices on completed plant, including dam, pipe-line, penstocks, generating units, transformers and transmission lines to the city. Specifications will be furnished on application to J. D. Ross, Sup't of Lighting, Seattle.

ELEVATOR PLANTS—Sealed proposals will be opened July 23 for the installation complete of an elevator plant in connection with the extension to each of the following buildings: The United States postoffice and courthouse at East St. Louis, Ill., the United States postoffice and courthouse at Huntington, W. Va., and the United States postoffice and customhouse at Nashville, Tenn., in accordance with the drawings and specification, copies of which may be had at the office of the Supervising Architect, Washington, D. C.

ELEVATOR PLANT—Sealed proposals will be opened July 30 for the installation complete of an elevator plant in the United States postoffice, Portland, Ore., in accordance with the drawings and specification, copies of which may be had at the office of the Supervising Architect, Washington, D. C.

ELECTRICAL MACHINERY AND SUPPLIES—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for the following: One motor-driven, tool-room lathe; two motor-driven, 2-spindle, flat, turret lathes; one motor-driven, vertical, turret, 30-inch lathe; one motor-driven, universal milling machine. The first two lathes and the milling machine for delivery at Navy Yard, Mare Island, Cal.; the 30-inch lathe for delivery at Philadelphia Navy Yard. Application cards and schedules can be obtained from Navy Purchasing Office at nearest navy yard.

ELECTRICAL EQUIPMENT — Sealed propcsals indorsed "Proposals for Electric Lighting System, Structural Shop, New York," will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 30, for an electric lighting system for the structural shop at the navy yard, New York. F. R. Harris, chief of Bureau.

ELECTRICAL EQUIPMENT—L. Panton, president of Board of Public Works, Billings, Okla., will receive bids until August 1 for waterworks, light and sewer systems, estimated to cost about $60,000.

ELECTRICAL EQUIPMENT — Sealed proposals will be received until July 24 for furnishing and delivering to the Randolph Street Bridge, Chicago, a motor-driven center lock, according to plans and specifications on file in the office of the Department of Public Works, Room 406 City Hall, Chicago. Address Frank I. Bennett, commissioner of public works.

## FINANCIAL NOTES

Union Gas & Electric Company of Cincinnati, O., filed with the city auditor the company's check for the franchise tax, and a statement showing gross earnings of the company for three months ended June 30 were $619,721.04, exceeding those for the corresponding period of 1916 by more than $42,000.

Preliminary earnings of Northern States Power Company for June indicate the largest gains ever made by that company in a summer month. Gross revenue for June was $526,471, an increase of $89,632, or 20½ per cent, over last year. Increased business is said to come from normal sources rather than war business. Upwards of 5,000 horsepower of new power business already contracted for will be connected in the next few months.

The American Light & Traction has purchased the White Star Coal Company, with properties in Harlan County, Kentucky. Subsidiary companies of the American Light & Traction Company have set aside funds which amount to about $100,000, to be given to the American Red Cross.

Western Power Company of Canada, Ltd., the reorganized Western Canada Power Company, reports operating revenues of $38,205 for May, 1917, an increase of 36 per cent over May last year. May net earnings were $27,430, an increase of 34 per cent over 1916. For the twelve months ended May 31, net earnings were $319,863, showing an increase of 40 per cent over the previous twelve months.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRIC COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

| Public Utilities— | Div. rate per cent. | Bid July 10. | Bid July 17. |
|---|---|---|---|
| Adirondack Electric Power of Glens Falls, common | .. | 18 | 18 |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 73 | 73 |
| American Gas & Electric of New York, common | 10+extra | 118 | 118 |
| American Gas & Electric of New York, preferred | 6 | 48 | 48 |
| American Light & Traction of New York, common | .. | 316 | 308 |
| American Light & Traction of New York, preferred | 6 | 109 | 109 |
| American Power & Light of New York, common | 4 | 67½ | 67 |
| American Power & Light of New York, preferred | 6 | 87½ | 87½ |
| American Public Utilities of Grand Rapids, common | .. | 28 | 28 |
| American Public Utilities of Grand Rapids, preferred | 6 | 64 | 63 |
| American Telephone & Telegraph of New York | .. | 120⅝ | 120¾ |
| American Water Works & Elec. of New York, common | .. | 8 | 8 |
| American Water Works & Elec. of New York, particip. | 7 | 22 | 22 |
| American Water Works & Elec. of New York, first preferred | .. | 77½ | 77½ |
| Appalachian Power of Bluefield, common | .. | 5 | 5 |
| Appalachian Power of Bluefield, preferred | 7 | 30 | 30 |
| Cities Service of New York, common | 6+extra | 275 | 275 |
| Cities Service of New York, preferred | 6 | 85 | 84½ |
| Commonwealth Edison of Chicago | 8 | 123 | 120 |
| Comm. Power, Railway & Light of Jackson, common | 4 | 49 | 48 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 76 | 76 |
| Federal Light & Traction of New York, common | .. | 11 | 11 |
| Federal Light & Traction of New York, preferred | .. | 43 | 43 |
| Illinois Northern Utilities of Dixon | 6 | 78 | 78 |
| Middle West Utilities of Chicago, common | 2+2 extra | 54 | 40 |
| Middle West Utilities of Chicago, preferred | 6 | 70 | 70 |
| Northern States Power of Chicago, common | 7 | 93 | 93 |
| Northern States Power of Chicago, preferred | 7 | 96 | 96 |
| Pacific Gas & Electric of San Francisco, common | 5 | 55 | 55 |
| Pacific Gas & Electric of San Francisco, preferred | 6 | 88 | 88 |
| Public Service of Northern Illinois, Chicago, common | 7 | 94 | 92 |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 98½ | 98½ |
| Republic Railway & Light of Youngstown common | 4 | 32½ | 30½ |
| Republic Railway & Light of Youngstown, preferred | 6 | 65 | 65 |
| Standard Gas & Electric of Chicago, common | .. | 9½ | 9½ |
| Standard Gas & Electric of Chicago, preferred | 6 | 35 | 34½ |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | 6 | 6 |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 30 | 30 |
| United Light & Railways of Grand Rapids, common | 4 | 38 | 39 |
| United Light & Railways of Grand Rapids, preferred | 6 | 67 | 68 |
| Western Power of San Francisco, common | .. | 14 | 14 |
| Western Power of San Francisco, preferred | 6 | 53 | 53 |
| Western Union Telegraph of New York | extra | 93⅞ | 92⅞ |
| Industrials— | | | |
| Electric Storage Battery of Philadelphia, common | 4 | 61 | 61 |
| General Electric of Schenectady | 8 | 157½ | 157 |
| National Carbon of Cleveland, common | 8 | 73¾ | 79⅝ |
| National Carbon of Cleveland, preferred | .. | 133 | 130¾ |
| Westinghouse Electric & Mfg. of Pittsburgh, common | 5+extra | 50 | 49½ |
| Westinghouse Electric & Mfg. of Pittsburgh, preferred | 7 | 63 | 65 |

# Electrical Patents Issued July 3, 1917

**Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.**

**1,231,549. Post-Type Arc Lamp.** C. Aalburg and S. C. Hoey, assignors to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Post-top structure comprising pedestal and arc enclosing and cooling chambers mounted thereon.

**1,231,557. Motor-Control System.** H. I. Beach, assignor to Westinghouse Electric & Mfg. Co. Armature current is increased, maintaining field constant; and then field is decreased, maintaining armature current constant.

**1,231,561. Suction-Controlled Switch.** S F. Briggs, assignor to Briggs & Stratton Co., Milwaukee, Wis. Structure of device having diaphragm-operated contacts.

**1,231,568. Electric Cable.** L. R. Clark, Englewood, N. J. Insulated conductor is composed of twisted bare wires wound with stiff conducting ribbon to break joints.

**1,231,573. Apparatus for Electric Railway Vehicles.** J. L. C. Davis, deceased; M. S. Davis, administratrix, assignor to Westinghouse Electric & Mfg. Co. Dynamotor is controlled to drive a load at constant speed with varying voltage.

**1,231,584. Electrical Apparatus.** R. E. Ferris, assignor to Westinghouse Electric & Mfg. Co. Manner of controlling compressor pump drive.

**1,231,587. Shielding System for Vapor-Converters.** C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. A conductor embraces the arc and means is provided for adjusting its potential to that of either electrode and intermediate valves.

**1,231,588. Magnetic Material.** L. T. Frederick and L. McCulloch, assignors to Westinghouse Electric & Mfg. Co. Bodies of magnetic material are stuck to fibrous sheets which are stacked in desired form.

**1,231,590. Brake Mechanism.** E. Friedlaender, assignor to Westinghouse Electric & Mfg. Co. Shoes are operated by magnet through a toggle.

**1,231,592. Shielding System for Vapor-Converters.** L. E. Frost, assignor to Westinghouse Electric & Mfg. Co. In a rectifier a shield between anodes is maintained positive with relation to the cathode.

**1,231,598. System of Control.** A. J. Hall and L. G. Riley, assignors to Westinghouse Electric & Mfg. Co. Series-parallel control of railway motors.

**1,231,599. Motor-Control System.** E. A. Hanf, assignor to Westinghouse Electric & Mfg. Co. Combination with controller of a resistor controlled by abnormal circuit conditions.

**1,231,604 and 1,231,605. System of Control.** R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. Railway motor control comprising motor-generator sets for exciting series field windings of motors.

**1,231,613. System of Pump Control.** H. D. James, assignor to Westinghouse Electric & Mfg. Co. Flow of fluid in a pipe supplied from motor pump is regulated according to current supplied to motor.

**1,231,614. Motor Control System.** W. R. Johnston, assignor to Westinghouse Electric & Mfg. Co. Electromagnetic switches automatically control field and armature currents at predetermined maximum and minimum values of the armature current.

**1,231,620. Ventilating Apparatus.** J. A. Kuyser, assignor to Westinghouse Electric & Mfg. Co. For circulating air through enclosed motors or dynamos.

**1,231,628. Potential-Regulator.** E. Lehr, assignor to Westinghouse Electric & Mfg. Co. Fluid-pressure operated.

**1,231,629. Telephone-Switchboard.** H. H. Lowry, assignor by mesne assignments to Western Electric Co., Inc., New York, N. Y. Sections comprise two parts, one permanently wired, with line and multiple jacks, and the other portion carrying link circuits, is removable so that different link circuit may be readily installed for different classes of service.

**1,231,632. Electric Regulating-Switch.** L. Miller and L. Boothman, assignors to Westinghouse Electric & Mfg. Co. A main rheostat having steps each equal to the resistance of an auxiliary rheostate, is operated a step after each cycle of operation of the auxiliary rheostat.

**1,231,633. Brake.** C. B. Mills, assignor to Westinghouse Electric & Mfg. Co. Shoes are operated by an electromagnet through a toggle.

**1.231.637. Interlock for Starting Motors.** J. F. Nikonow, assignor to Westinghouse Electric & Mfg. Co. Means for connecting starting motor with engine of automobile is interlocked with means connecting the engine with the vehicle drive.

**1,231,638. Starting and Generating Mechanism.** J. P. Nikonow, assignor to Westinghouse Electric & Mfg. Co. Unitary structure of motor and generator with gearing connecting them when motor is driver and disconnecting when motor is driven.

**1,231,639. Starting Mechanism for Automobiles.** J. P. Nikonow, assignor to Westinghouse Electric & Mfg. Co. Dynamo electric machine is connected to engine shaft at different speed ratios in starting and running.

**1,231,648. Transformer.** E. G. Reed, assignor to Westinghouse Electric & Mfg. Co. Core structure and support.

**1,231,651. Means for Starting Synchronous Machines.** E. Rosenberg, assignor to Westinghouse Electric & Mfg. Co. Specially connected auxiliary machine starts and synchronizes main machine.

**1,231,652. Synchronous Dynamo-Electric Machine and Method of Starting Therefor.** E. Rosenberg, assignor to Westinghouse Electric & Mfg. Co. Manner of starting with an induction motor.

**1,231,658. Control System.** K. A. Simmon and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Switching arrangements for connecting to voltage taps in a railway control system.

**1,231,659. Electrical Protective Device.** B. H. Smith, assignor to Westinghouse Electric & Mfg. Co. Structure of electromagnetic device for controlling circuit breaker in a polyphase circuit.

**1,231,662, 1,231,663 and 1,231,664. Control System.** N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. First patent, manner of utilizing a storage battery on a railway control and lighting circuit. Second patent, means for automatically changing the connection of railway motors to adapt them to run from trolleys of different voltages. Third patent, modification of first wherein provision is made for energizing motor field from the battery.

**1,231,665. System of Control.** N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Has a storage battery connected in the circuit with propelling motors of a railway, and a motor-generator set for regulating the battery current.

**1,231,666. Regulating-Controller for Electric Motors.** H. R. Stuart, assignor to Westinghouse Electric & Mfg. Co. Speed governor for an induction motor comprising an automatic regulator of the secondary resistance.

**1,231,667. Incandescent Lamp.** H. A. Styring, Middletown, Ohio. Structure of base and socket for controlling the lighting of several filaments.

**1,231,677. Signal-Lamp.** F. W. Wakefield, assignor to the F. W. Wakefield Brass Co., Vermillion, Ohio. A headlight or similar structure has a colored transparent tube slidable along the reflector axis to surround or be disposed back of the lamp.

**1,231,681. Circuit-Breaker for Ignition Systems.** J. A. Williams, assignor to the K-W Ignition Co., Cleveland, Ohio. Structure of cam-operated contacts.

**1,231,682. Starting and Generating Mechanism.** C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Structure of automatically operated gearing of different ratios for connecting dynamo-electric machine with engine.

**1,231,702. Illuminating Attachment for Retractors.** W. J. Cameron, Chicago, Ill. Details of mounting of lamp socket.

**1,231,708. Battery-Tester.** E. L. Clark, assignor by mesne assignments to National Carbon Co. Comprises a solenoid coil having an armature actuating an indicating rod passing through the center of the core.

**1,231,714. Starting Device for Multiphase Motors.** H. H. Cutler, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Details of step-by-step switching mechanism electromagnetically operated from the supply circuit, controls rotor resistance.

**1,231,749. Electrically-Heated Instrument.** F. Kuhn, Detroit, Mich. Soldering iron comprising adjacent members in heat-conducting contact, having their contacting surfaces coated with aluminum.

**1,231,750. Luminous Electric Heater.** F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co., Detroit, Mich. Structure of resistor and reflector.

**1,231,753. Electric Starting and Generating Apparatus.** T. L. Lee, assignor to North East Electric Co., Rochester, N. Y. Circuit arrangements of dynamoelectric machine and storage battery.

**1,231,768. Interrupter-Clamp for Ignition-Dynamos.** F. C. Manning, assignor to Splitdorf Electrical Co., Newark, N. J. For adjustably securing interrupter to magneto frame.

**1,231,800. Telephone System.** F. M. Slough, assignor by mesne assignments to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Details of cord circuit.

**1,231,804. Wire-Clamp.** H. C. Staton, Burlington, Iowa. Adapted to secure together and form contact between two insulated wires.

**1,231,810. Motor Cut-Out.** C. E. Taylor, assignor of one-half to David Seville, Columbus, Ohio. Details of switch comprising push plugs adapted to shunt respectively circuits adapted to be intermittently closed.

**1,231,819. Electric-Lamp Socket.** C. A. Walling, Merryville, La. Details of socket and switch structure.

**1,231,821. Variable Electric Sign.** H. F. Walton, South Bend, Ind. For producing an electric form display, having the background luminous when the form is in dark outlines and the ground dark when the form is luminous.

**1,231,829. Process for Electrolytically Precipitating Metals.** G. C. Westby, Ludwig, Nev., assignor to Western Process Co. An iron anode is employed in an acid solution with an initial heavy charge of ferrous sulfate containing varying amounts of sulfur dioxid and copper sulfate.

**1,231,835. Electromagnetically-Operated Horn.** B. Ames, Lowell, Mass. Details of device having electromagnetic vibrator operating diaphragm.

**1,231,844. Brush-Lifting Device.** A. J. Brown, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Structure for dynamoelectric machines.

**1,231,846. Vehicle-Control System.** J. T. Cade, assignor to Federal Signal Co. Block signal system for railways comprises an alarm device on the trackway and controlled by a wayside signal for alarming the passengers.

**1,231,847. Automatic Signal.** J. M. Carson, Los Angeles, Cal. Structure of device comprising signal arm with solenoids for drawing it in either direction.

**1,231,863. Overhead Pin-Setting Mechanism.** R. F. Downey, assignor to Downey Automatic Pin Setter Co., Milwaukee, Wis. Bowling pins are electromagnetically held in apparatus.

**1,231,864. Magnetically Controlled Collecting Mechanism.** R. F. Downey, assignor to Downey Automatic Pin Setter Co., Milwaukee, Wis. For collecting bowling pins.

**1,231,875. Magnetic Choking Device.** H. H. Gifford and W. Gifford, Traverse City, Mich. Coil structure.

**1,231,882. Cluster-Top for Electric Lamps.** E. J. Y. Hammett, Philadelphia, Pa. For standing lamps.

**1,231,883. Apparatus for Electrical Sterilization of Food.** J. Hanssen, Christiania, Norway. For treating with current of high voltage, especially for killing mite, spores and noxious bacteria on split cod.

**1,231,885. Electric Steering Mechanism.** J. O. Heinze, assignor to the J. O. Heinze Co., Springfield, Ohio. Rod connecting wheel knuckles of automobile is shifted endwise by reversible motor.

**1,231,895. Apparatus for Regulating the Temperature of Superheated Steam.** D. S. Jacobus, assignor to the Babcock & Wilcox Co., Bayonne, N. J. A chamber to which superheated steam is admitted also receives fluid for moderating the temperature of the steam, and a circuit controlling the fluid valve is controlled according to the temperature of the modified steam.

**1,231,922. Telephone-Exchange System.** A. E. Lundell, assignor to Western Electric Co. Arrangements for connecting between central offices.

**1,231,947. Supporting-Bracket for Lamps.** L. Schepmoes, assignor to Safety Car Heating & Lighting Co. Arrangement of conduit, junction box, etc., in car roof.

**1,231,953. Electric Power System.** H. M. Shedd, Elizabeth, N. J. Electromagnetic mechanism effecting regulation ac-

cording to whether motor is supplied with direct or alternating current.

**1,231,955. Electrolytic Cell Structure.** H. B. Slater, Riverside, Cal. Structure and mounting of electrodes.

**1,231,964. Means for Indicating at a Distance the Level of Liquids.** V. Suchanek, assignor to G. P. Poulalion and G. A. Poulalion, Paris, France. Indicator circuit controlled by float.

**1,231,967. Electrolytic Recovery of Metals from Their Solutions, and an Apparatus Therefor.** U. C. Tainton and M. F. L. Aaymard, Johannesburg, Transvaal, South Africa. Comminuted conducting material is added to a solution and deposited on a pervious electrode support, and the metal values are then electrolytically deposited on the coating, which is removed with the metal and the latter recovered.

**1,231,983. Engine-Starting Apparatus.** V. G. Apple, Dayton, Ohio. Mounting and gearing of starting motor.

**1,231,984. Radiotransmission.** H. D. F. Arnold and H. W. Nichols, assignors by mesne assignments to Western Electric Co., Inc. A system comprising an audion for receiving electromagnetic waves of a definite frequency.

**1,231,991. Car-Lighting System.** W. L. Bliss, assignor by mesne assignments to U. S. Light & Heat Corp., Niagara Falls, N. Y. Regulation of a system comprising a variable-voltage generator and a storage battery.

**1,231,992. Electrical Switch.** O. R. Blumberg and B. D. Horton, assignors to Detroit Fuse & Mfg. Co., Detroit, Mich. Three-phase motor starting switch.

**1,232,012. Induction-Motor.** A. M. Dudley, assignor to Westinghouse Electric & Mfg. Co. Structure of squirrel cage.

**1,232,033. Regenerative Control System for Alternating-Current Motors.** R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. For operation from a single-phase source.

**1,232,037. Illuminated Advertising Vehicle Roof.** A. Jaminet, San Mateo, Cal. Arrangement of lamps and reflector for illuminating a long translucent advertising or destination sheet in outer wall of car.

**1,232,045. Selective Telegraph System and Apparatus.** C. L. Krum and H. L. Krum, Chicago, Ill. Printing telegraph apparatus.

**1,232,046. Projection-Lamp.** K. Kleinert, assignor to the firm of Robert Bosch, Stuttgart, Germany. Structure of headlight.

**1,232,050. Pressure-Riveter.** F. Kraemer, assignor by direct and mesne assignments to Pan-American Eectric Tool Co. Milwaukee, Wis. Pressure members for setting rivets are operated by solenoid-actuated toggles.

**1,232,062. Process for the Manufacture of Thermo Elements.** W. Low, assignor to the firm of Schott & Gen, Jena, Germany. Manner of joining sheets of different metals and reducing them to desired thickness and width.

**1,232,080. Process of Recovering Copper.** F. J. Pope and A. W. Hahn, Douglas, Ariz. Electrolysis is employed in cyclic method of extracting copper from copper-bearing material whose copper content is soluble in sulfuric acid solution.

**1,232,087. Automatic-Telephone Register-Sender.** F. N. Reeves and A. E. Lundell, assignors to the Western Electric Co., Inc., New York, N. Y. Arrangement of impulse-operated relays actuating a call storing register.

**1,232,106. Set and Release Device for Circuit Breakers and Other Mechanism.** O. F. Shepard, Jr., Cincinnati, Ohio. Mechanism for setting toggle in position to hold contact bridge closed and for releasing same.

**1,232,123. Train Control and Signal System.** J. T. Thompson, Chicago, Ill. Details for gearing to the car axle switching devices for the signal and controlling mechanism.

**1,232,150. Apparatus for Electrically Operating Planing-Machines and Like Reciprocating Tools.** A. P. Wood and R. S. McLeod, Didsbury, near Manchester, England. For operating the feed screw of reciprocating tools.

**1,232,152. Motor Drive.** J. J. Wood, assignor to General Electric Co., Schenectady, N. Y. For sewing machines.

**1,232,174. Electromagnetic Engine.** E. Bachelet, Mt. Vernon, N. Y. Has a progressively energized solenoid and both it and the core reciprocate.

**1,232,176. Electrically-Operated Pipe-Organ.** W. J. Baker, assignor to the Harno-Electric Co., Chicago, Ill. Organ is electrically controlled from piano keyboard, and both may be played, or either alone.

**1,232,179. Electric Furnace for Fixing Nitrogen from the Air.** S. Barford, Oakland, Cal. For treating air with the electric arc.

**1,232,183. Controlling System.** H. M. Bascom, assignor to American Telephone & Telegraph Co. Telephone service observing system.

**1,232,201. Portable Lamp for Harness.** C. F. Brown, St. Albans, Vt. Wiring, etc., for lamp mounted on breast collar.

**1,232,209. Synchronous Motor.** A. R. Bullock, assignor to H. C. Lee, trustee, of Los Angeles, Cal. Motor is started by connecting windings on stator and rotor, one of them commutated, in parallel across A. C. line, and then a polar winding is excited from a D. C. source and the commutated winding cut out.

**1,232,224. Telegraph System.** H. P. Clausen, assignor by mesne assignments to Western Electric Co., Inc., New York, N. Y. Comprises a thermally actuated relay for energizing a signal when the sender remains idle in effective position beyond a certain interval.

**1,232,250. Semi-Automatic Telephone-Exchange System.** A. H. Dyson, assignor by mesne assignments to Western Electric Co., Inc., New York, N. Y. Arrangement of registering devices and interoffice trunks.

**1,232,253. Electrical Apparatus.** A. L. R. Ellis, assignor to General Electric Co. Alternating current measuring instrument having coils of interwoven conductors to equally distribute the magnetic effects with relation to the armature.

**1,232,278. Insulator.** W. T. Goddard, Hamilton, Ontario, Canada. Suspension type.

**1,232,279. Telephone-Exchange System.** C. L. Goodrum, assignor to Western Electric Co., Inc., New York, N. Y. Grouping arrangement for automatic trunk connections.

**1,232,289. Tamper-Switch.** L. A. Grimes, Orange, N. J. Structure of switch contacts actuated by removal of cover of casing.

**1,232,303. Spark-Plug.** C. G. Harvey, Devils Lake, N. D. Structural details.

**1,232,311. Snap-Switch.** A. Holshauer, Jr., Wauwatosa, Wis. Details of lamp socket structure.

**1,232,322. Alternating-Current Motor Starter.** I. W. Kahn, Detroit, Mich. Structural details of switch.

**1,232,338. Automatic Telephone-Exchange System.** J. W. Lattig and C. L. Goodrum, assignors by mesne assignments to Western Electric Co., Inc. Circuit arrangements.

**1,232,345. Semi-Automatic Telephone System.** A. E. Lundell, assignor by mesne assignments to Western Electric Co., Inc. Comprises indicating device and register for numbers of called lines.

**1,232,347. Ignition-Dynamo.** S. C. McKeown, assignor by mesne assignments to Splitdorf Electrical Co., Newark, N. J. Special structure of rotor in inductor type magneto.

**1,232,354. Insulator.** J. E. Mair, assignor to the Brunt Tile & Porcelain Co., Columbus, Ohio. Two-part tile or porcelain knob.

**1,232,362. Electric Furnace.** C. G. Miner, Berkeley, Cal. Structure utilizing electric arcs.

**1,232,372. Controlling Apparatus for Electric Motors.** H. C. Moseley, assignor to Whitaker-Gleasner Co., Wheeling, W. Va. Has a normally open motor circuit and normally closed control circuit, with provision for dynamic braking.

**1,232,386. Circuit-Closer for Fire-Alarm Systems.** D. Famp, Chester, Pa. Special contact structure held open by fusible element.

**1,232,395. Process of Separating the Constituents of Liquids.** W. A. Schmidt and L. Bradley, assignors to Research Corp., New York, N. Y. For separating portions of a solution of different volatility; solution is made into spray, a portion is evaporated and remainder precipitated by subjection to electric discharge.

**1,232,408. Radiation Pyrometer.** C. B. Thuring, assignor to Thuring Instrument Co., Philadelphia, Pa. Mounting of thermo couple in muffle mounted in refractory wall exposed to heat.

**1,232,412. Switch and Fuse Construction.** H. L. V. Valkenburg, Edgewater Park, N. J. Structure and arrangement of base, contacts, etc.

**1,232,441. Breakdown-Detector for Rail-Joint Insulation.** G. P. Thurber, assignor by mesne assignments to Automatic Train Control & Signal Co., Pittsburgh, Pa. A conductor is embedded in the insulation for each joint of the insulated section and connected to the opposite rail outside the section.

**1,232,442. Safety Signal System.** G. P. Thurber, assignor by mesne assignments to Automatic Train Control & Signal Co., Pittsburgh, Pa. Railway block signal system.

**1,232,450. Resistance Element.** J. A. Misland, Bayonne, N. J. Base coil has its convolutions moved into and out of contact to vary resistance, and means for short-circuiting the coil when it is fully contracted.

**1,232,451. Electric Regulating Device.** J. A. Misland. Modification of above.

**1,232,453. Annunciator.** A. Sullwold, Grove, Okla. Thermostatically controlled circuit closer arrangements.

**1,232,456. Relay.** W. L. Bliss, assignor by mesne assignments to U. S. Light & Heat Corp., Niagara Falls, N. Y. Operation of fluid pressure operated switch is controlled by electromagnetically regulated vent valve.

**1,232,458. Ignition-Switch.** J. F. Cavanagh, assignor to Connecticut Telephone & Electric Co., Meriden, Conn. Circuit is held closed by thermostatically controlled push button.

**1,232,467. Spark-Gap.** F. W. Peek, Jr., assignor to General Electric Co. For a protective device; special spacing of two spheres.

**1,232,479. Shielding System for Vapor-Converters.** S. W. Farnsworth, assignor to Westinghouse Electric & Mfg. Co. Details of structure surrounding electrode.

## Patents Expired.

The following United States electrical patents expired on July 17, 1917:

653,649. Underground System of Electric Railways. C. A. Balph, Pittsburgh, Pa.

653,685. Electric Cutout. H. P. Maxim, Hartford, Conn.

653,698. Electric Switch. J. T. Robb, New York, N. Y.

653,708. Hydro-electro-therapeutic Apparatus. J. T. Stanger, Ulm, Germany.

653,713. Electric Clock. S. P. Thrasher, New Haven, Conn.

653,715. Apparatus for Electrically Treating Fabrics for Waterproofing or other Purposes. J. T. Van Gestel, New York, N. Y.

653,725. Electric Motor. D. C. Woodward, Hartford, Conn.

653,730. Telephone Transmitter Arm. J. F. Craven, Pittsburgh, Pa.

653,763, 653,764 and 653,765. Electro-galvanic Battery. H. J. Brewer, New York, N. Y.

653,770. Galvanic Battery. A. Heil, Frankfort-on-the-Main, Germany.

653,784. System of Electrical Distribution. C. D. W. Anderson, Chicago, Ill.

653,785. Electric Arc Lamp. S. Bergmann, New York, N. Y.

653,806. Electric Meter. C. D. Haskins, Newton, Mass.

653,841. Electric Fuse. T. H. Brady, New Britain, Conn.

653,857. Electrical Controller. E. H. Wise, Johnstown, Pa.

653,875. Process of Manufacturing Homogeneous Mixtures for Filaments of Incandescent Electric Lamps. K. Ochs, Berlin, Germany.

653,883. Secondary Battery. A. Reuterdahl, Providence, R. I.

653,885. Casing for Electric Car-lighting Apparatus. W. F. Richards, Buffalo, N. Y.

653,906. Alternating-current Motor. E. W. Brown, Dayton, O.

653,933. Electrode for Electrolyzing Apparatus. R. Moritz, Lille, France.

653,934, 653,935 and 653,936. Page-printing Telegraph. D. Murray, New York, N. Y.

653,941. Telegraph Switching Apparatus. J. F. Skirrow, East Orange, N. J.

653,945. Commutator. Segment. J. Burke, New York, N. Y.

653,957. Magneto-electric Generator for Gas-engine Igniters. G. W. Henricks, Indianapolis, Ind.

653,963. Dynamo-electric Machine. W. M. Mordey, London, England.

653,970. Electric-railroad Track. E. Sollman, Hoboken, N. J.

653,982. Electric Headlight. J. W. G. Becker, Kansas City, Mo.

653,984. Electric Arc Lamp. H. G. Carleton, New York, N. Y.

654,050. Trolley Pole. C. A. Brown, Lorain, O.

654,067. Electric Low-water Alarm. F. Leadbetter, Detroit, Mich.

654,096. Hygienic Appliance for Sound-transmitter Mouthpieces. T. R. Owen, Los Angeles, Cal.

654,104. Measuring Instrument. K. O. F. Schrottke, Berlin, Germany.

654,105. Electric-railway Appliance. D. E. Shoop, Turtle Creek, Pa.

654,113. Battery Electrode. G. Heidel, St. Louis, Mo.